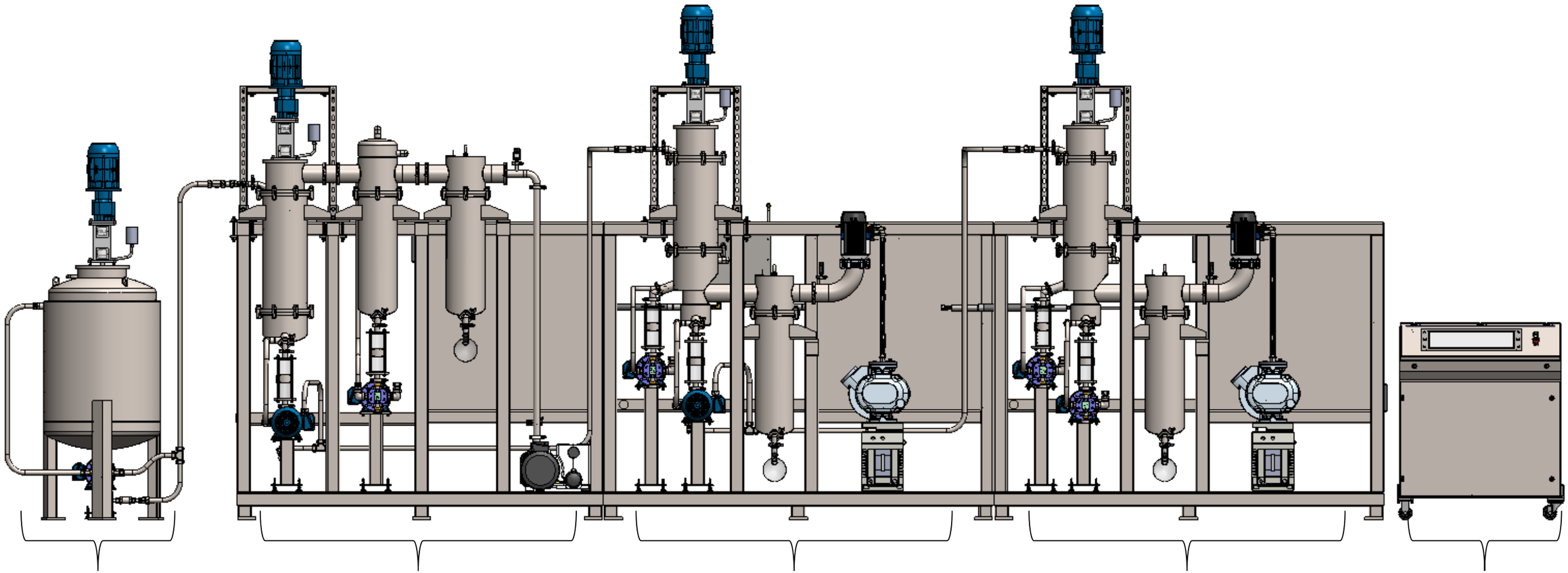
SPD 25.0 / FRAME



FEED TANK
Details on page 3

ROLLED FILM STAGE
(RF)
Details on page 5

SHORT PATH 1
(SP1)
Details on page 18

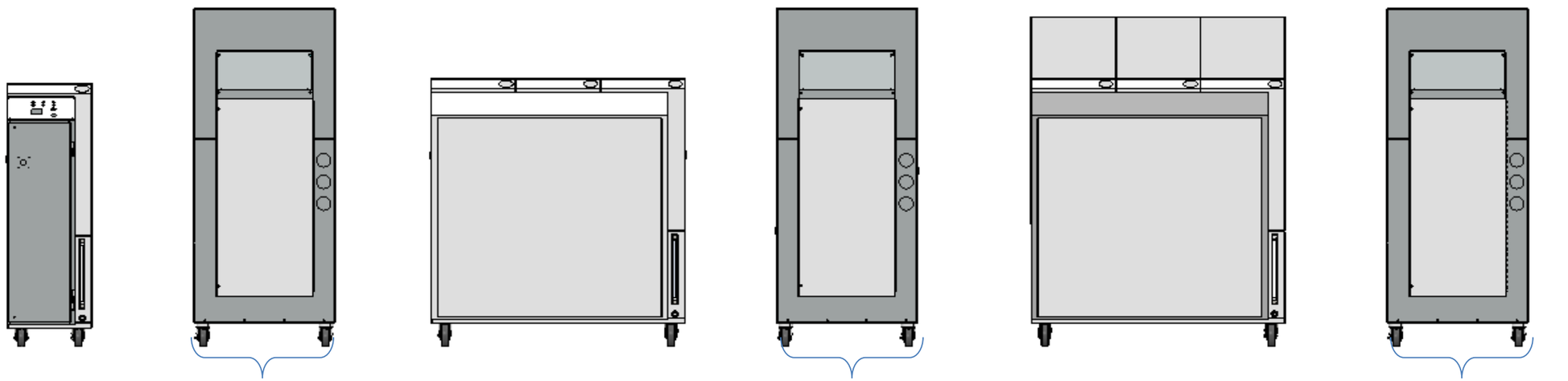
SHORT PATH 2
(SP2)
Details on page 24

CONTROL CONSOLE

SPD 25.0 / CIRCULATORS

In Sequence of Arrangement

FRONT VIEW



RF CHILLER

SP1 CHILLER

SP2 CHILLER

FEED TANK HEATING OIL CIRCULATOR

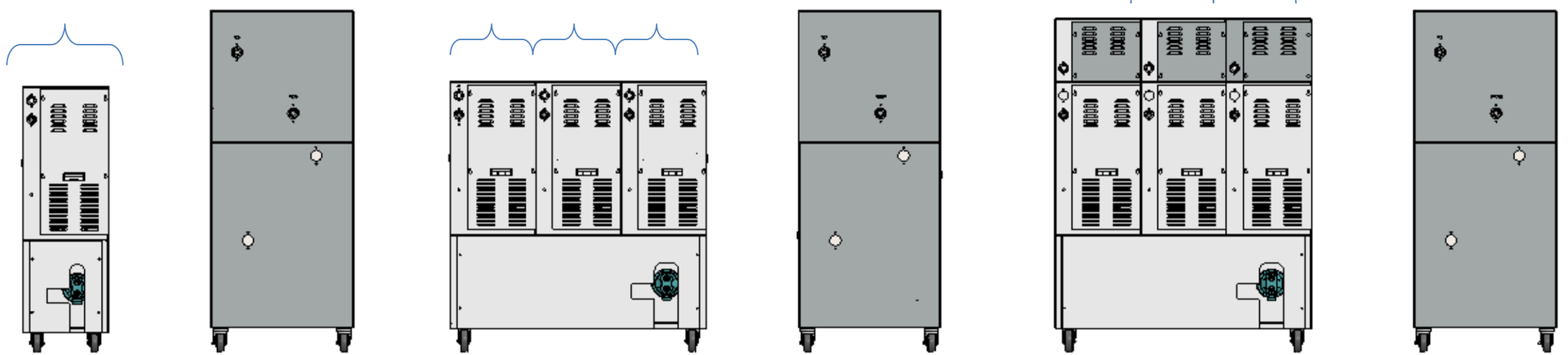
HEATING OIL RESIDUE CIRCULATOR

RF SP1 SP2

HEATING OIL EVAPOTATOR CIRCULATOR

RF SP1 SP2

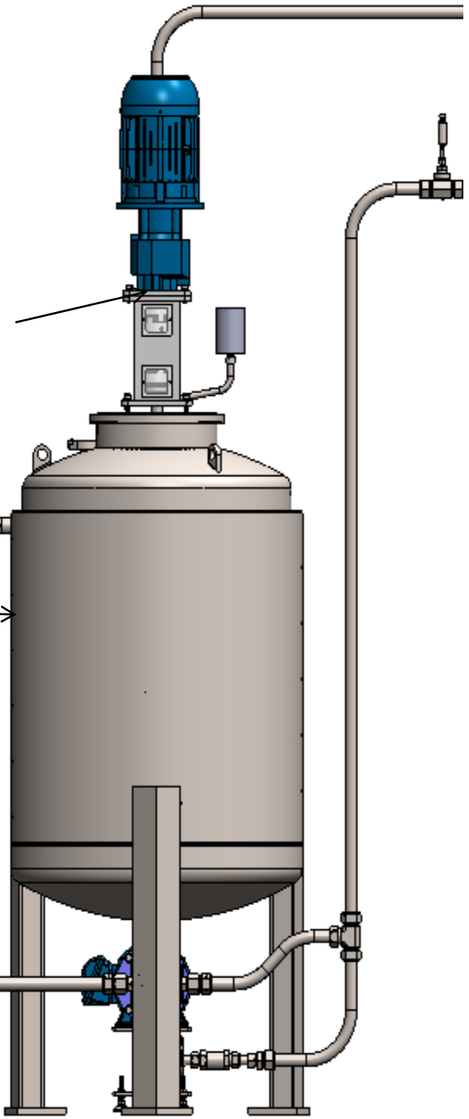
BACK VIEW



RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / FEED TANK

MOTOR AND GEAR BOX
Details on page 25



JACKATED
FEED TANK

TUBE
From: Feed Tank
To: Feed Pump

FRONT VIEW

TEPMERATURE
SENSOR

ROTARY SEAL
LUBRICATION
SYSTEM

LEVEL SENSOR

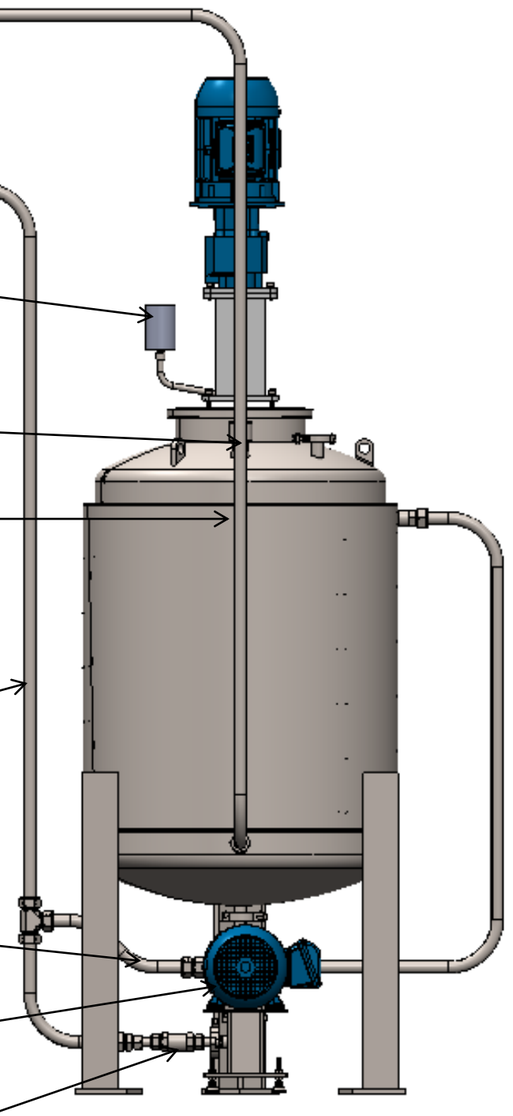
TUBE
From: Feed Circulator
To: Feed Tank

JACKATED FEED LINE
From: Feed Pump
To: RF Feed

TUBE
From: Feed Pump
To: Feed Jacket

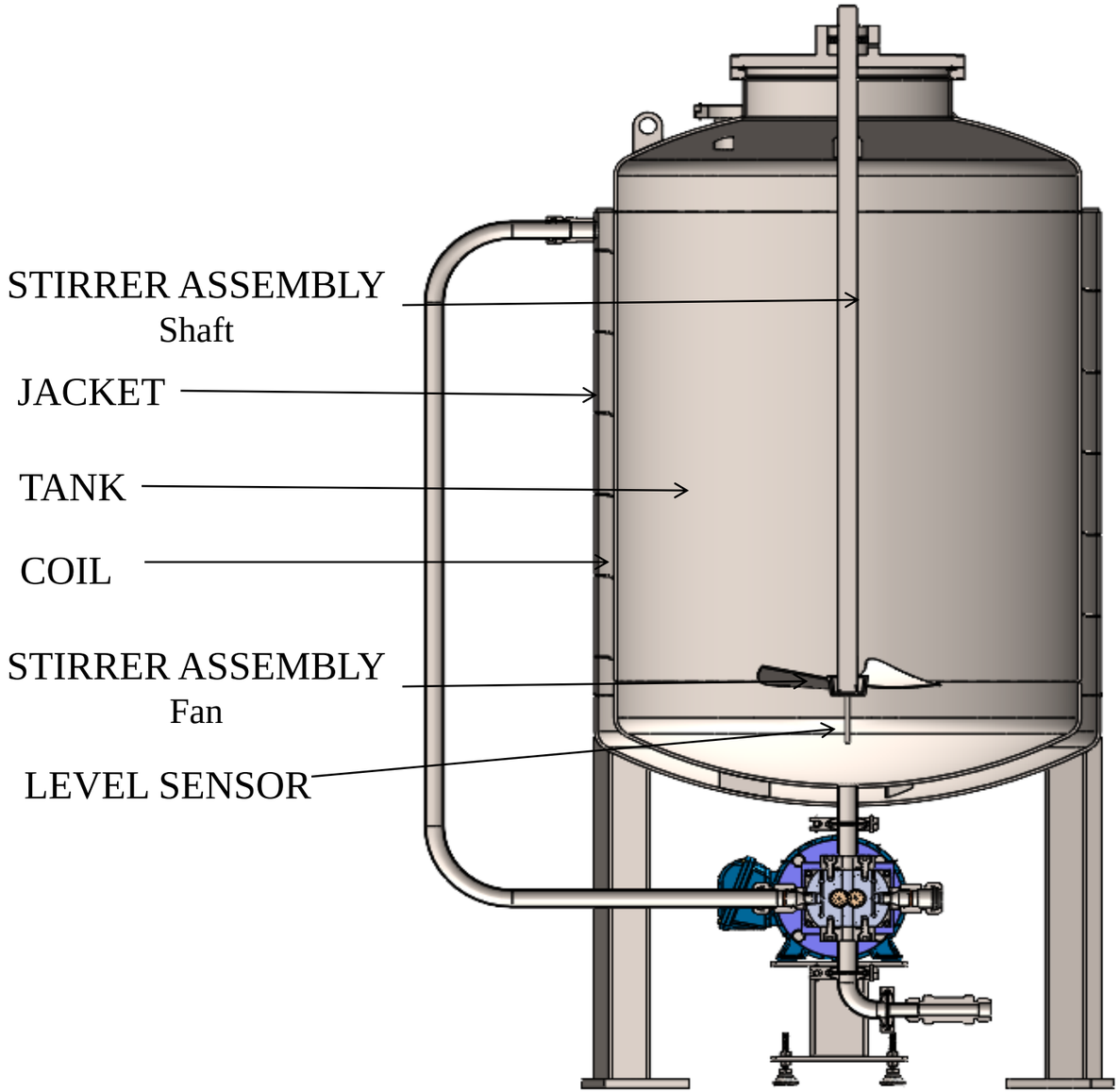
FEED PUMP

CHECK VALVE



BACK VIEW

SP25.0 / FRAME / FEED TANK



SECTION VIEW

JACKETED FEED TANK

Tank:

Feed tank consists of a 200 lts. (aprox. 53 gl or 211 qrts.) 316 SS tank to hold the feed stock. The tank is jacketed with heating oil to heat the feed stock. Coil around the tank creates the swirl path for heating oil for better heating.

Stirrer Assembly:

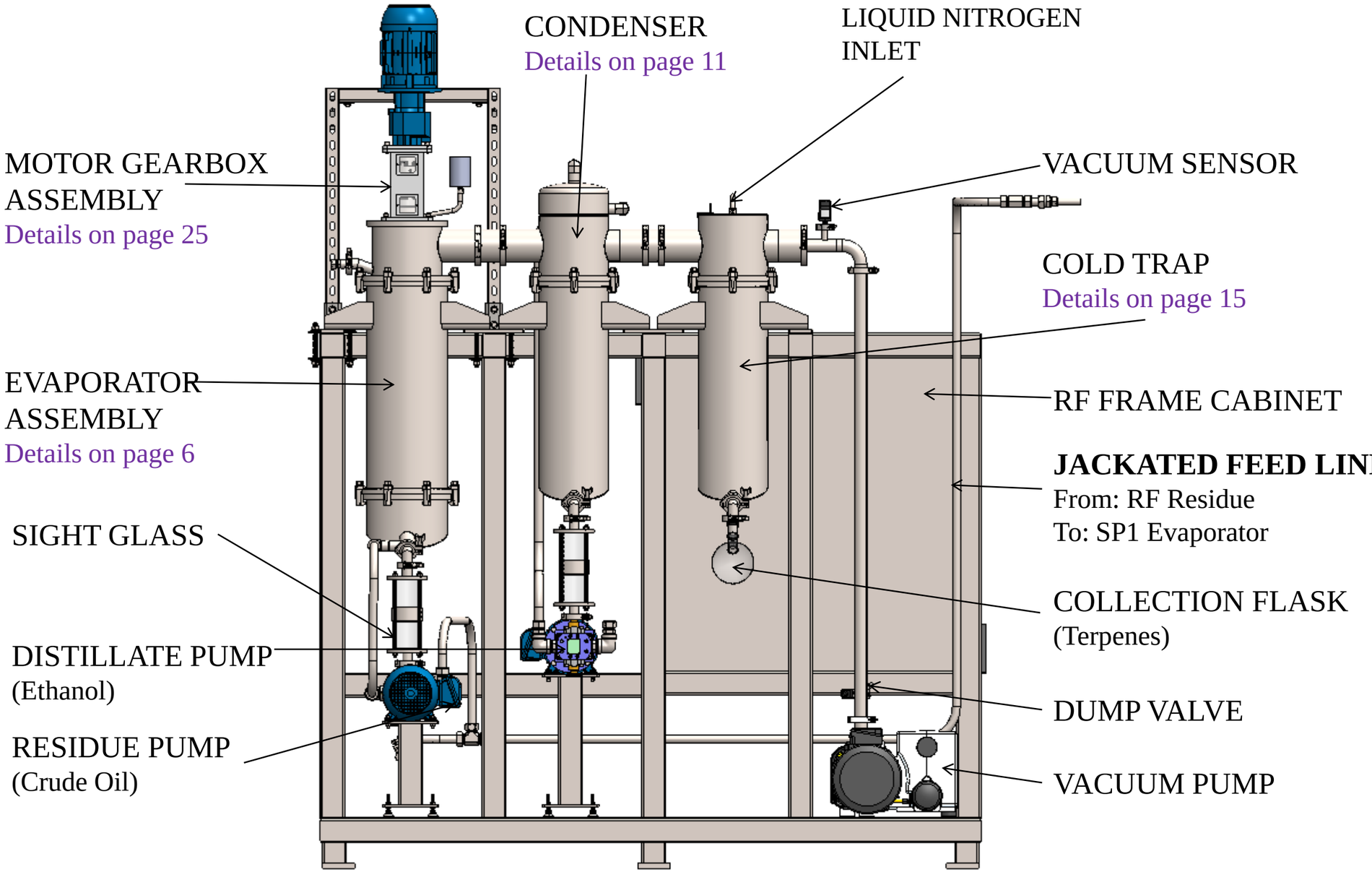
It consists of a motor with gearbox, shaft and a blade/fan. Speed of the motor can be controlled through control panel. It is used to maintain the homogeneity of crude oil and ethanol and avoid coagulation of the stock.

Feed Assembly:

It consists of a feed pump and a jacketed feed tube. The preheated stock from the tank is fed to the RF evaporator through the feed pump. Feed rate could be controlled via control panel but maximum recommended rate is 25 lts/hr. (aprox. 6.6 gl/hr. or 26 qrts./hr). Feed tube is a 3/4'' 316SS tube jacketed with 1'' 316SS heating oil tube. It is fitted with a temperature sensor to monitor the heating oil temperature.

SP25.0 / FRAME / RF

It’s the first stage of distillation process and it consists of a RF Evaporator , Condenser, Cold Trap and different pumps to control the flow of the stock. Vacuum pumps are used to create and maintain vacuum which facilitates evaporation at lower temperature.

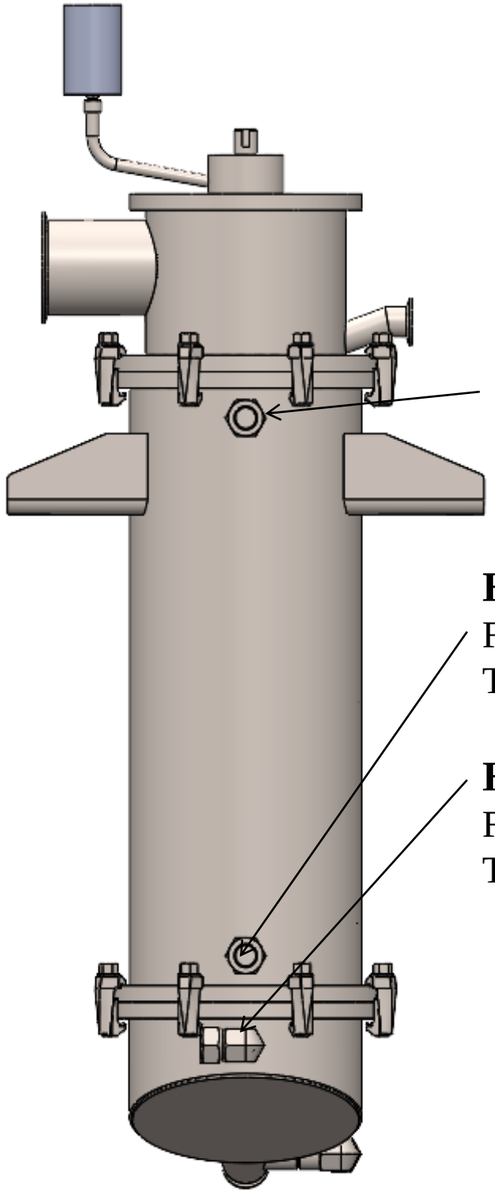


RF FRONT VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / RF / EVAPORATOR ASSEMBLY

USED IN RF ASSEMBLY ONLY.



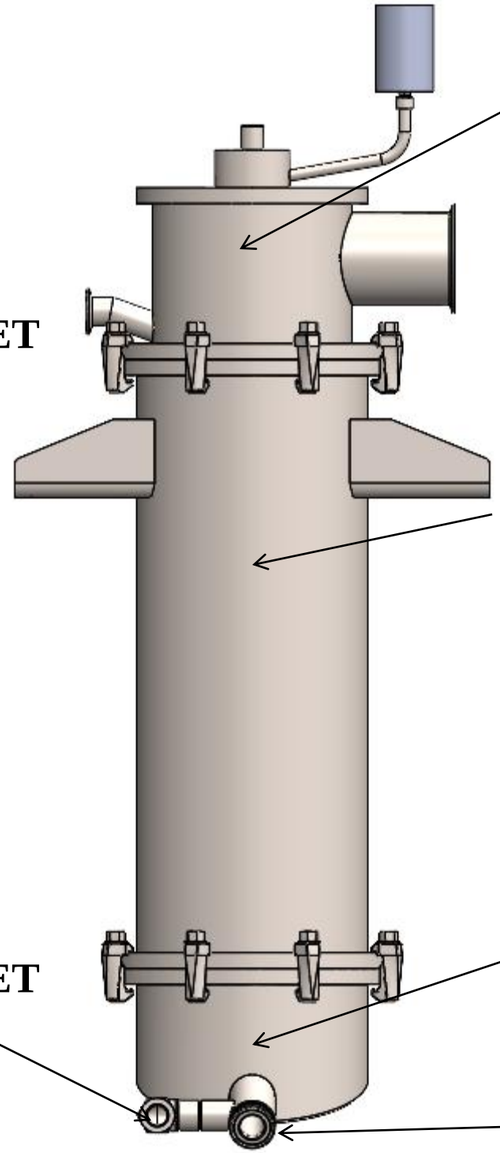
HEATING OIL OUTLET
From: RF Evaporator
To: Evap. Circulator

HETING OIL INLET
From: Evap. Circulator
To: RF Evaporator

HEATING OIL INLET
From: Residue Circulator
To: RF Residue

HEATING OIL OUTLET
From: RF Residue
To: Residue Pump

BACK VIEW



TEE ASSEMBLY
Details on page 8

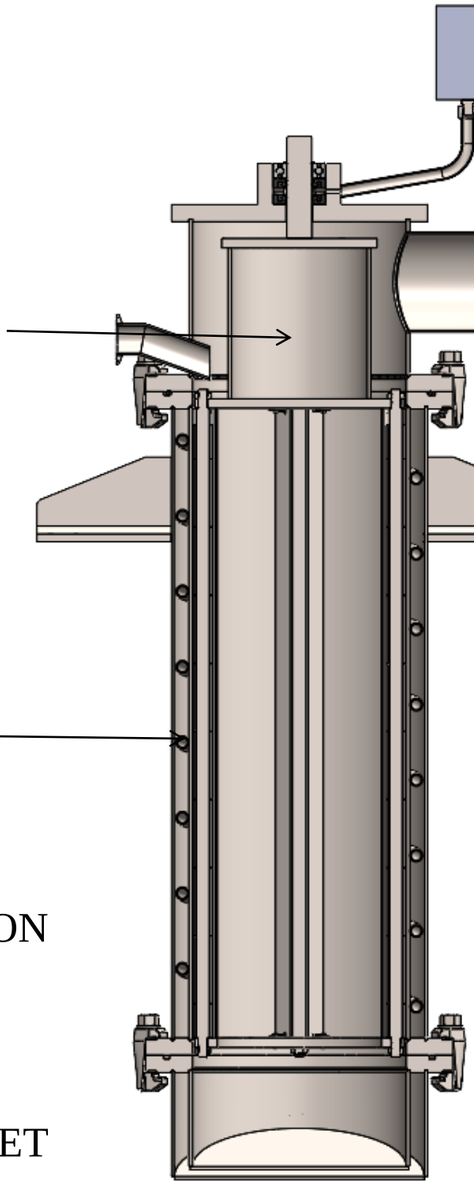
WIPER BASKET ASSEMBLY
Details on page 25

EVAPORATOR
Details on page 9

BOTTOM SECTION ASSEMBLY
Details on page 10

RESIDUE OUTLET
(Crude oil)

FRONT VIEW



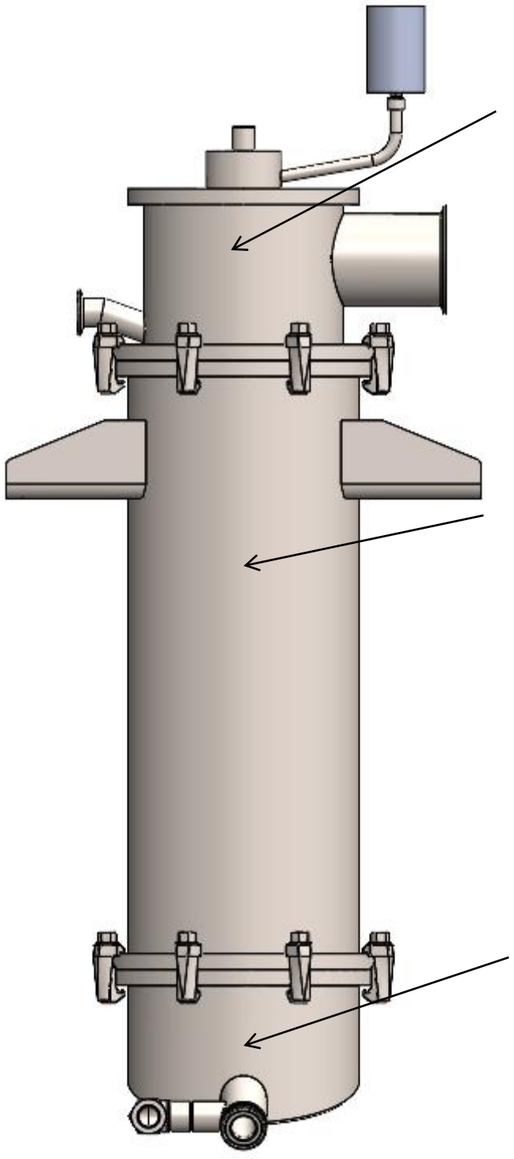
COIL

SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / RF / EVAPORATOR ASSEMBLY

USED IN RF ASSEMBLY ONLY.



TEE
ASSEMBLY
Details on page 8

JACKETED
EVAPORATOR
Details on page 9

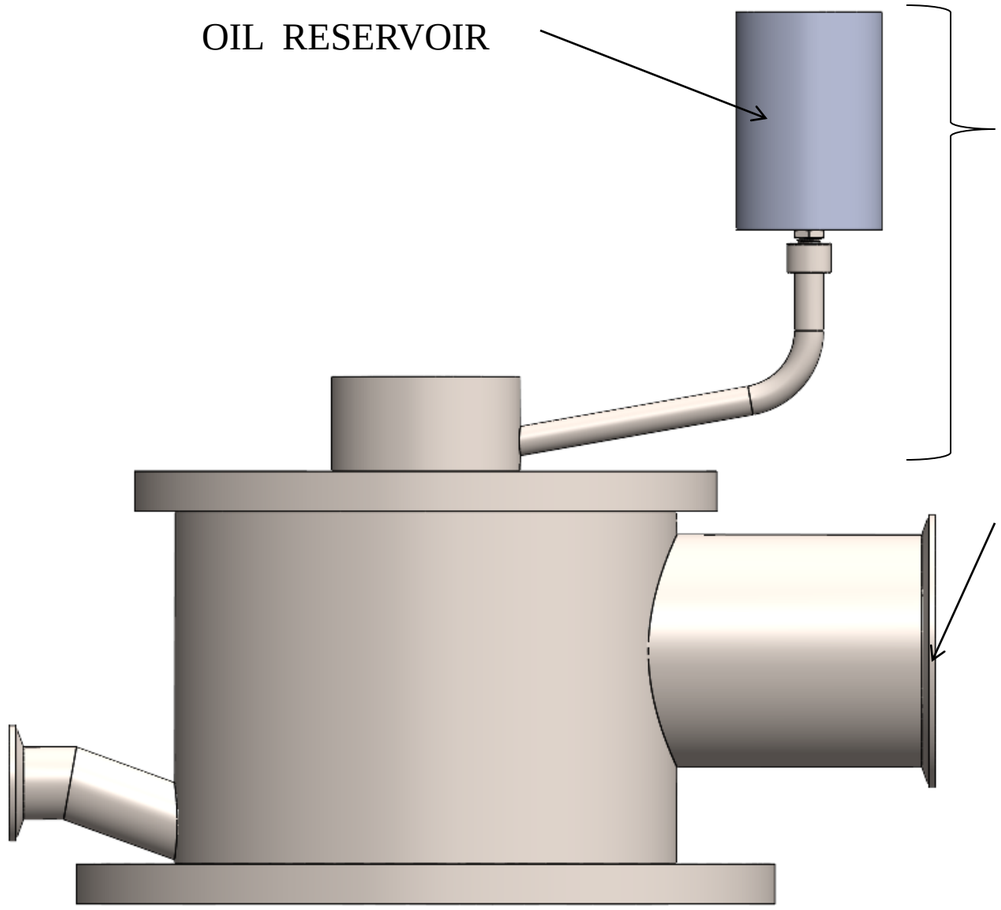
BOTTOM SECTION
ASSEMBLY
Details on page 10

RF EVAPORATOR ASSEMBLY:

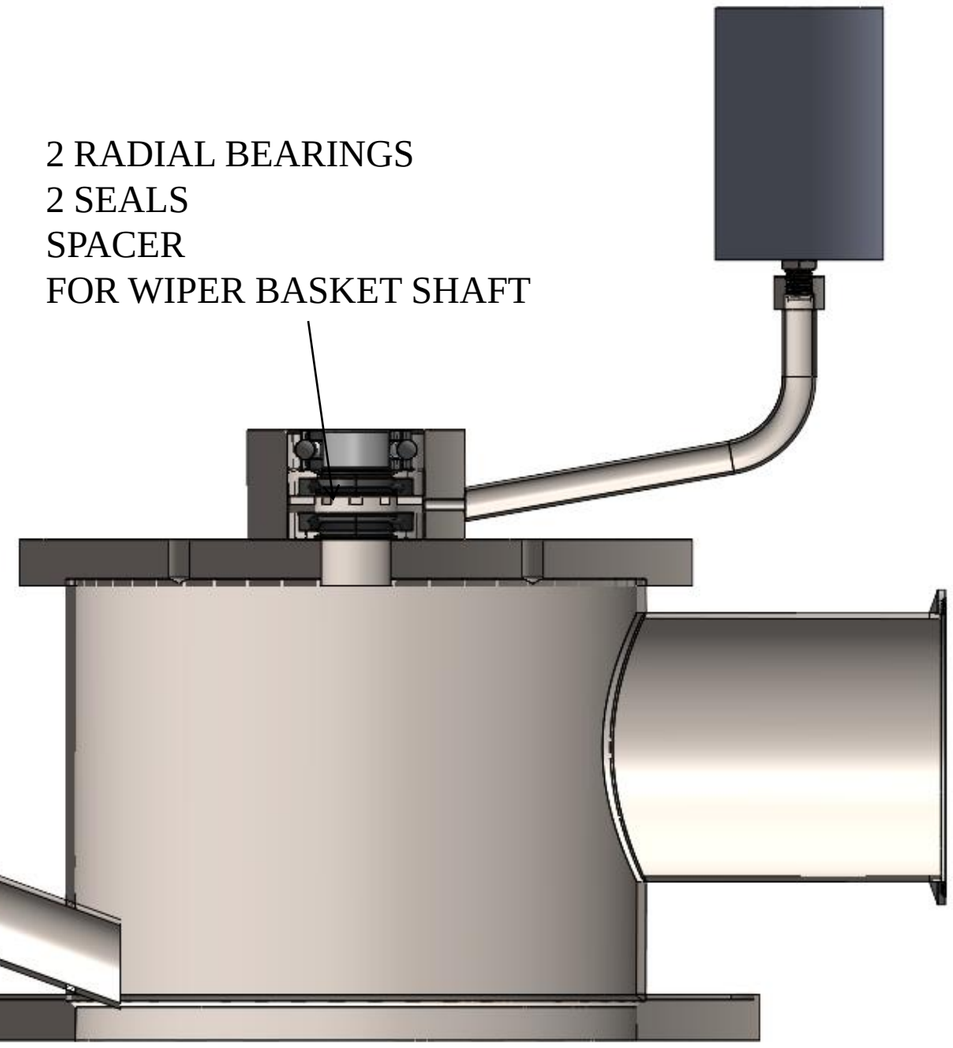
It consists of a Tee assembly, a jacketed RF evaporator and a bottom section assembly. Tee assembly houses the wiper basket assembly and also acts as inlet for feed and outlet for vaporized distillate. The Evaporator is surrounded by a heating oil which is responsible for heating and evaporating the volatile distillate. Coil inside the jacket facilitates the flow of heating oil. Bottom Section assembly collects the non evaporated feed and passes it through a residue pump to SP1 stage. The output of this stage is called residue and is generally crude oil.

SP25.0 / FRAME / RF / EVAPORATOR ASSEMBLY / TEE ASSEMBLY

USED ON RF EVAPORATOR ONLY.



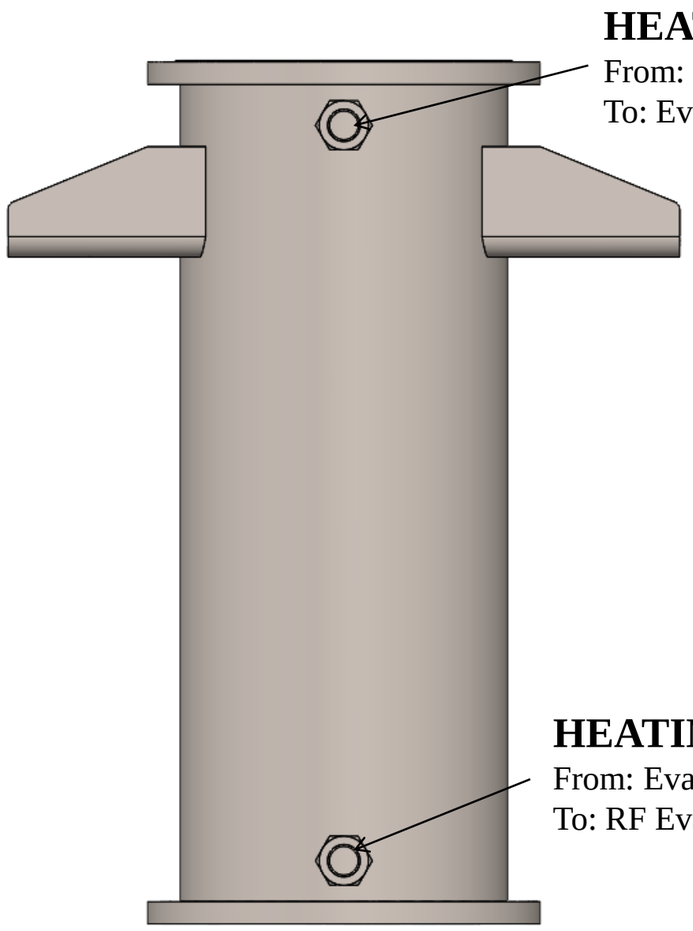
FRONT VIEW



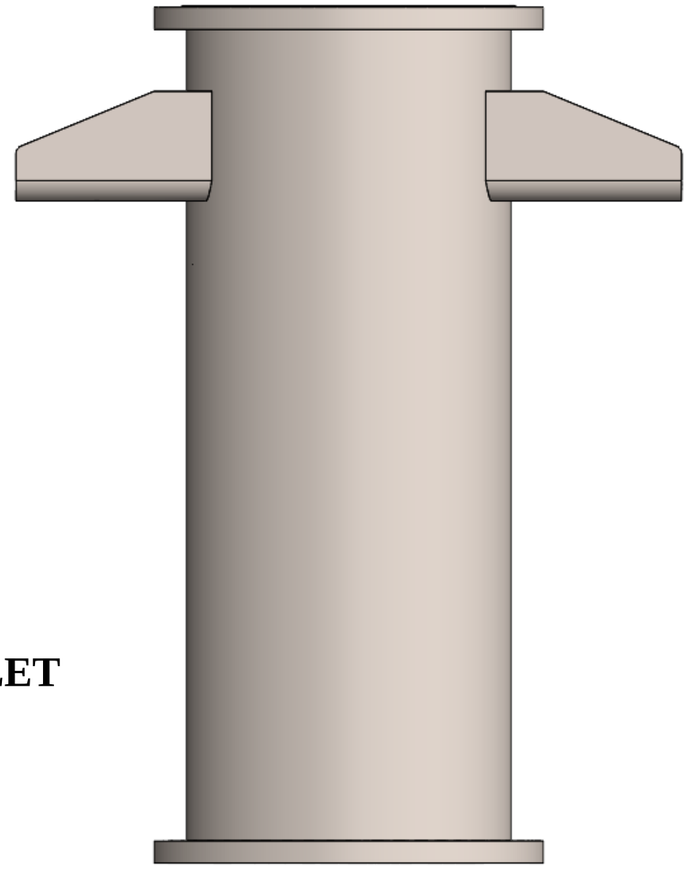
SECTION VIEW

SP25.0 / FRAME / RF / EVAPORATOR ASSEMBLY / EVAPORATOR

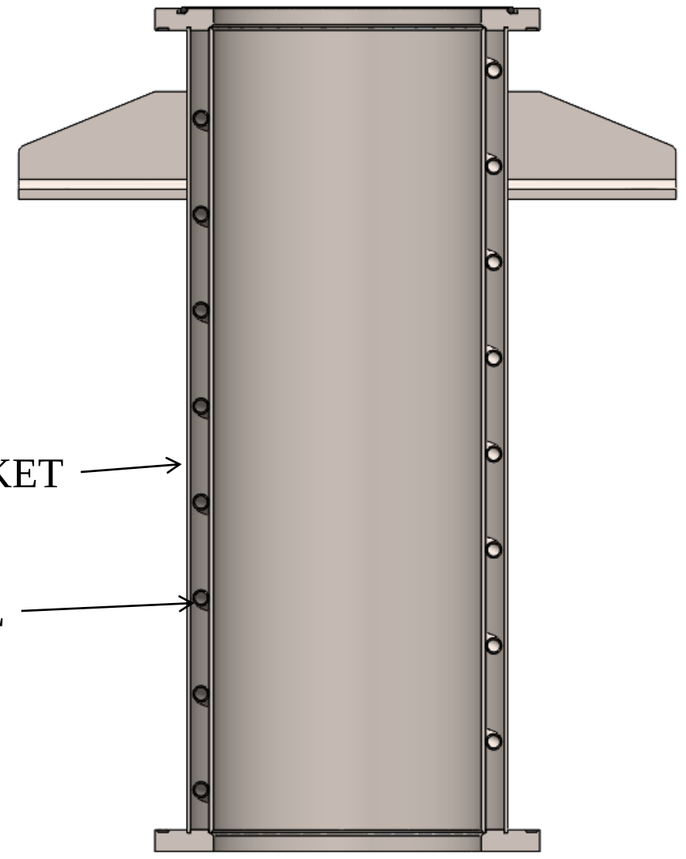
USED ON RF EVAPORATOR ONLY.



BACK VIEW



FRONT VIEW



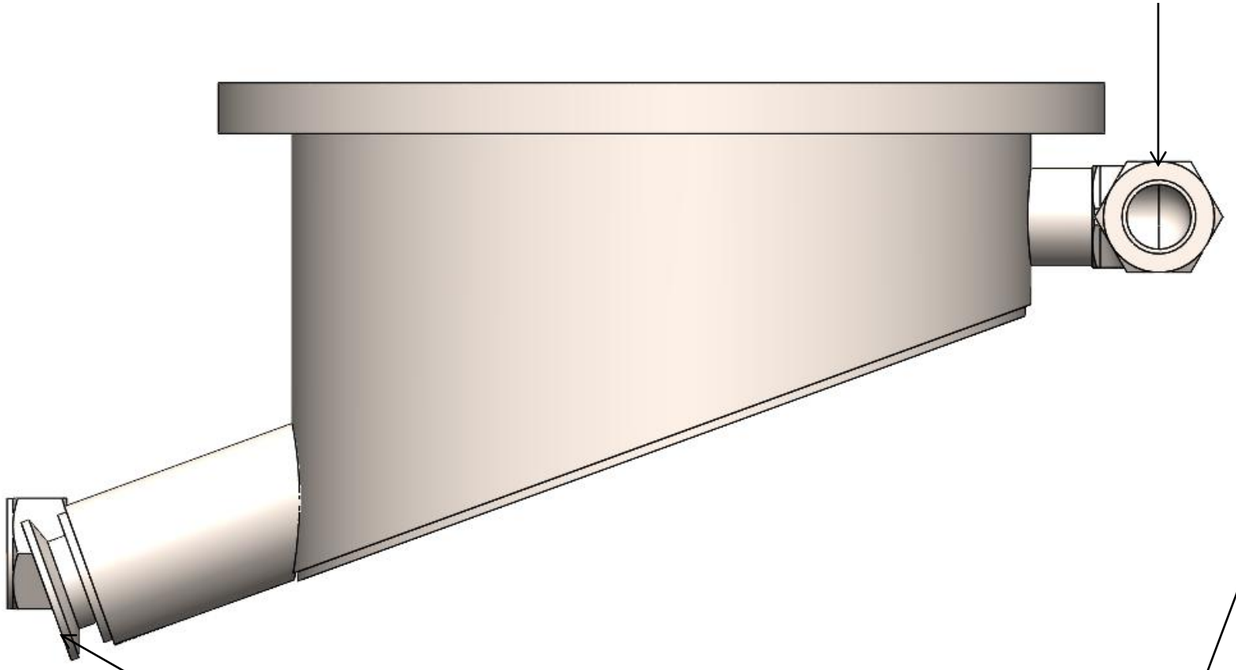
SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / RF / EVAPORATOR ASSEMBLY / EVAPORATOR

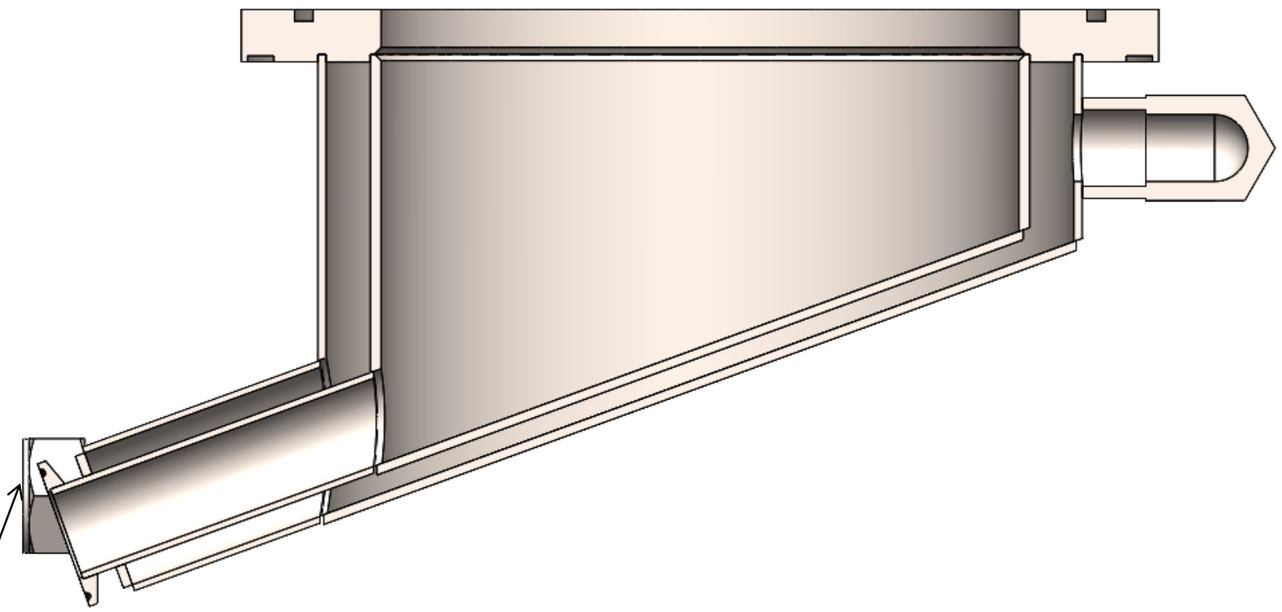
USED ON RF EVAPORATOR ONLY.

HEATING OIL INLET
From: Residue Circulator
To: RF Residue



RESIDUE OUTLET
(Crude oil)

RIGHT SIDE VIEW

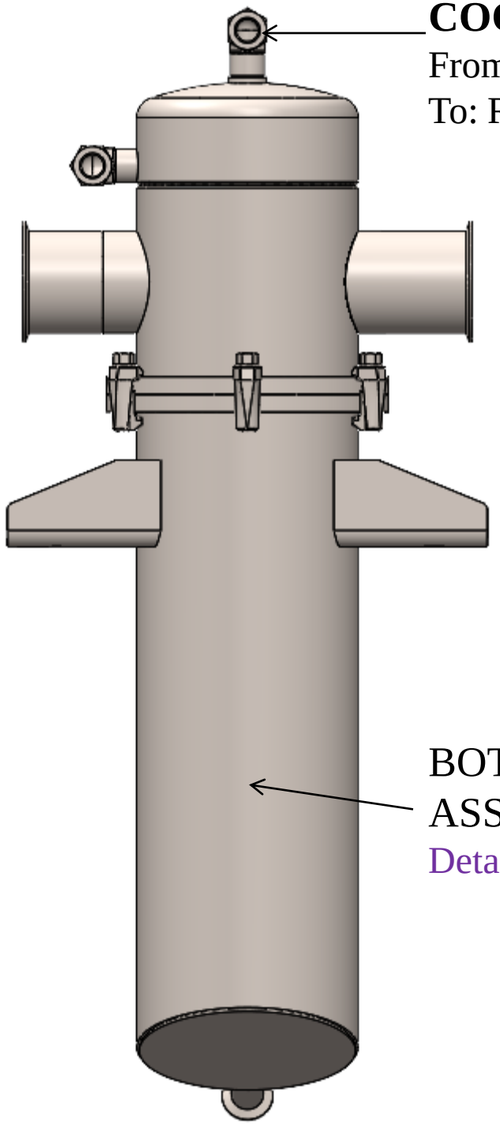


HEATING OIL OUTLET
From: RF Residue
To: Residue Pump

SECTION VIEW

SP25.0 / FRAME / RF / CONDENSER

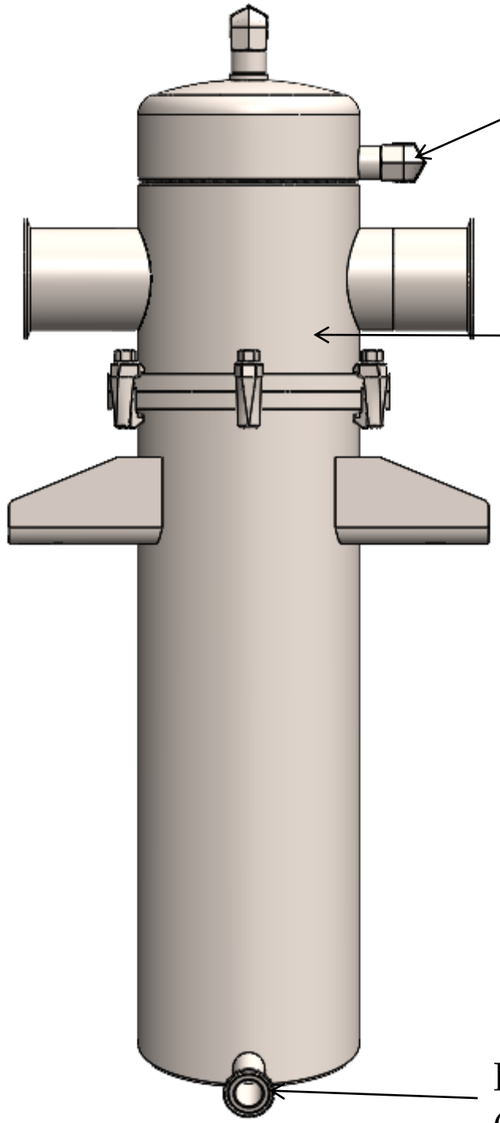
USED IN RF ASSEMBLY ONLY.



COOLANT INLET
From : RF Chiller
To: RF Condenser

BOTTOM ASSEMBLY
Details on page 14

BACK VIEW

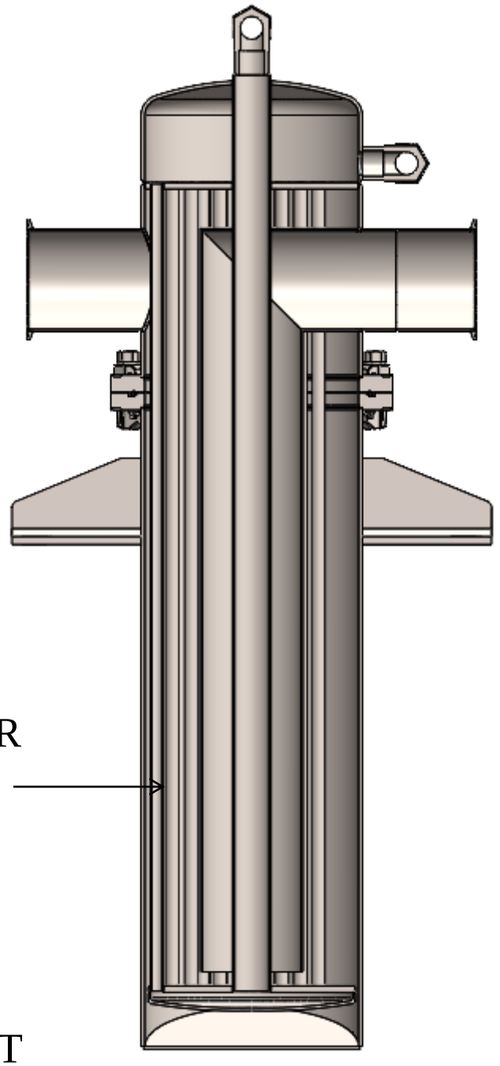


COOLANT OUTLET
From: RF Condenser
To: Distillate Pump

CONDENSER INSERT ASSEMBLY
Details on page 13

DISTILLATE OUTLET
(Ethanol)

FRONT VIEW



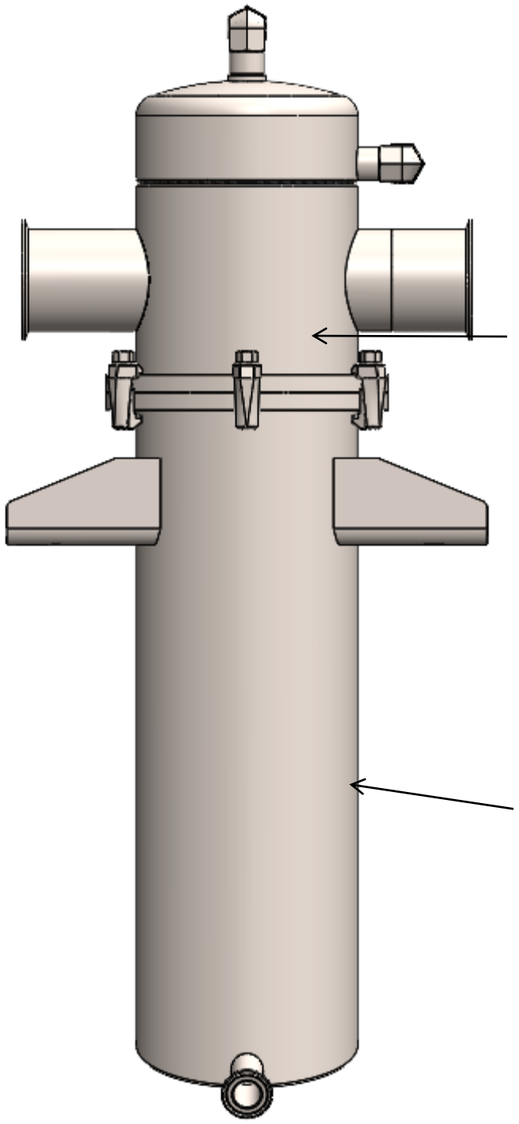
HEAT EXCHANGER TUBES

SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / RF / CONDENSER

USED IN RF ASSEMBLY ONLY.



CONDENSER INSERT ASSEMBLY
Details on page 13

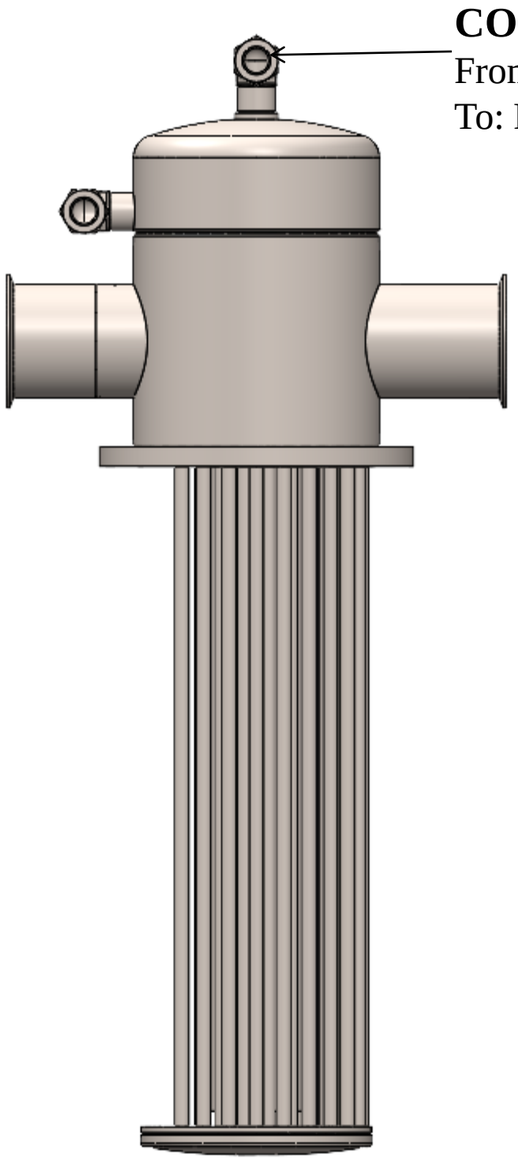
BOTTOM ASSEMBLY
Details on page 14

CONDENSER:

The condenser is supplied with coolant from RF chiller which helps it to condense the volatile distillate from RF stage. It is only part of RF assembly. The output of this stage is called distillate and is generally ethanol.

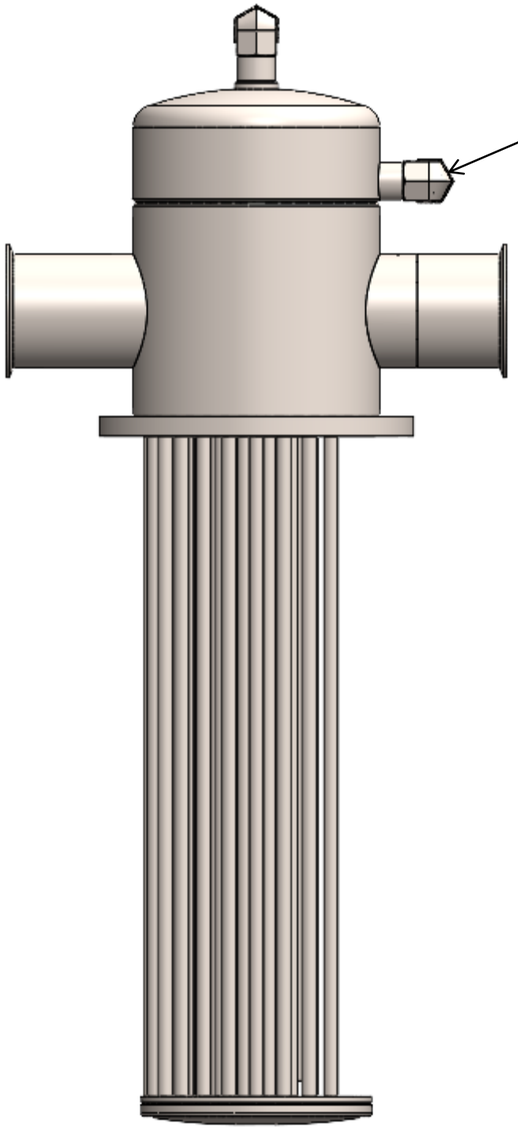
SP25.0 / FRAME / RF / CONDENSER / INSERT ASSEMBLY

USED IN RF CONDENSER ONLY.



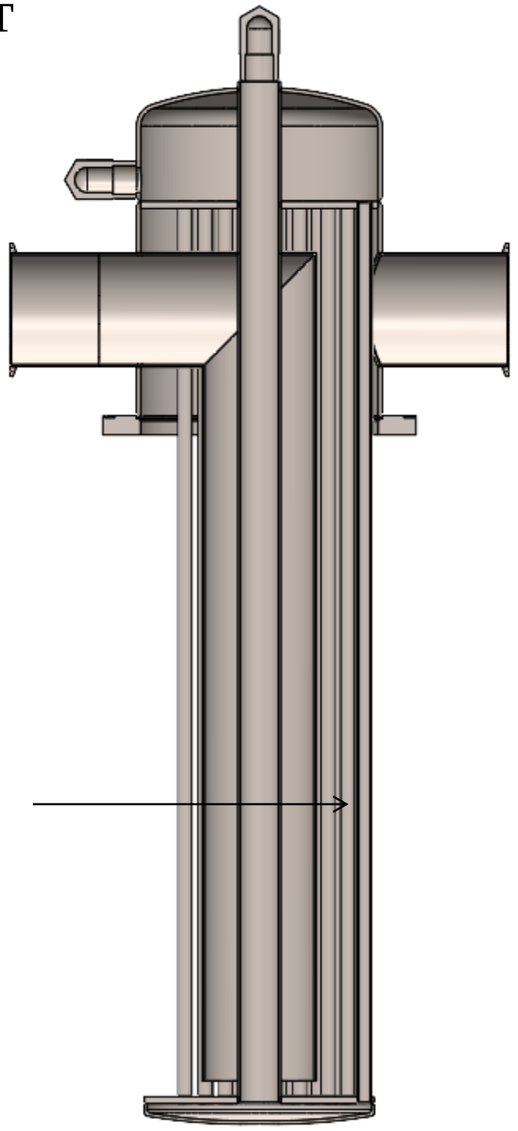
COOLANT INLET
From : RF Chiller
To: RF Condenser

BACK VIEW



COOLANT OUTLET
From: RF Condenser
To: Distillate Pump

FRONT VIEW



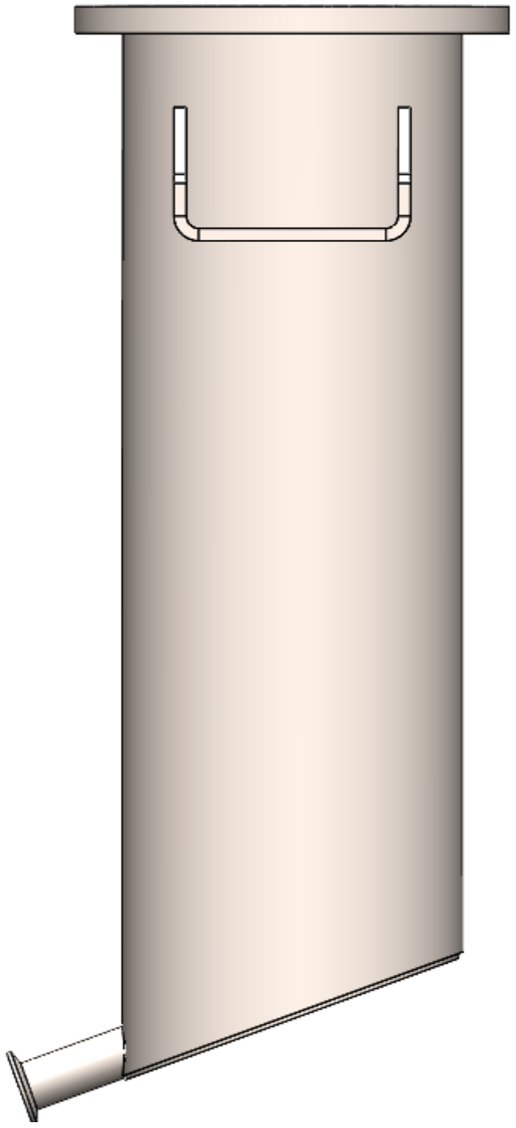
HEAT EXCHANGER TUBES

SECTION VIEW

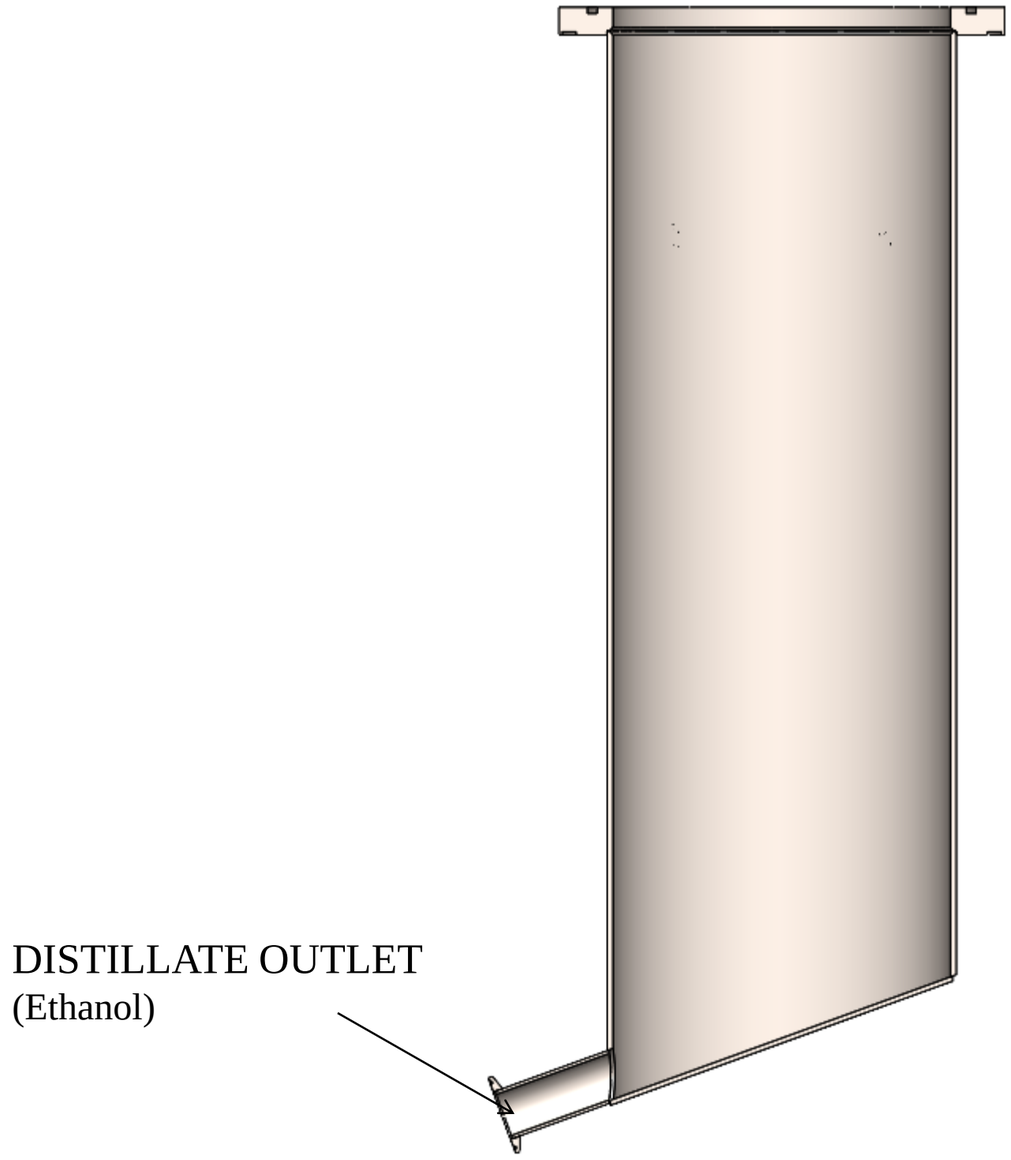
RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / RF / CONDENSER / BOTTOM ASSEMBLY

USED IN CONDENSER, COLD TRAP ASSEMBLIES OF RF, SP1, SP2.



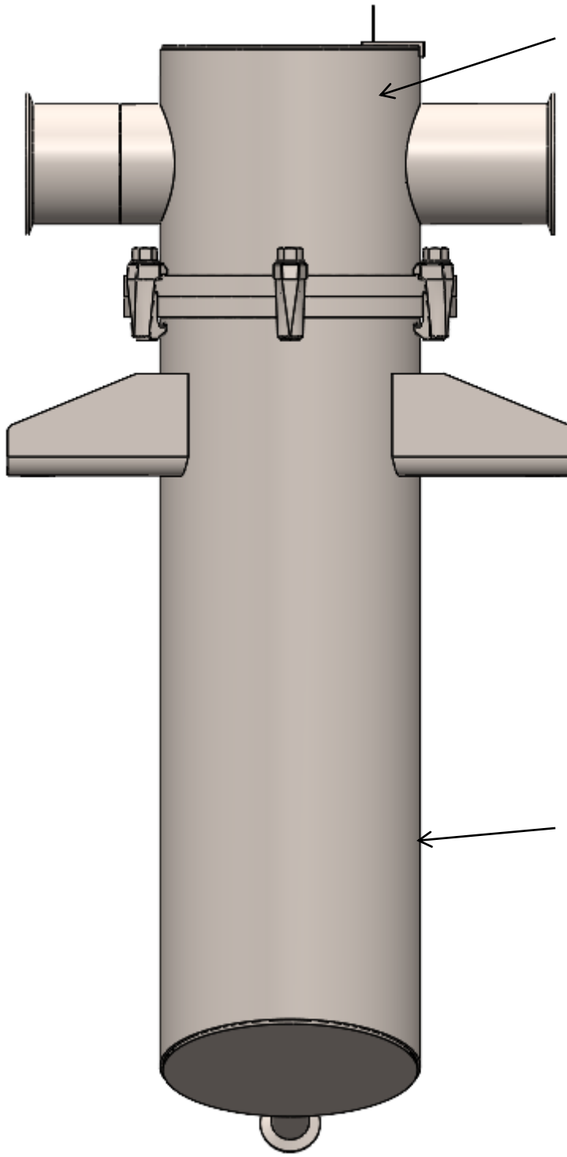
RIGHT SIDE VIEW



SECTION VIEW

SP25.0 / FRAME / COLD TRAP

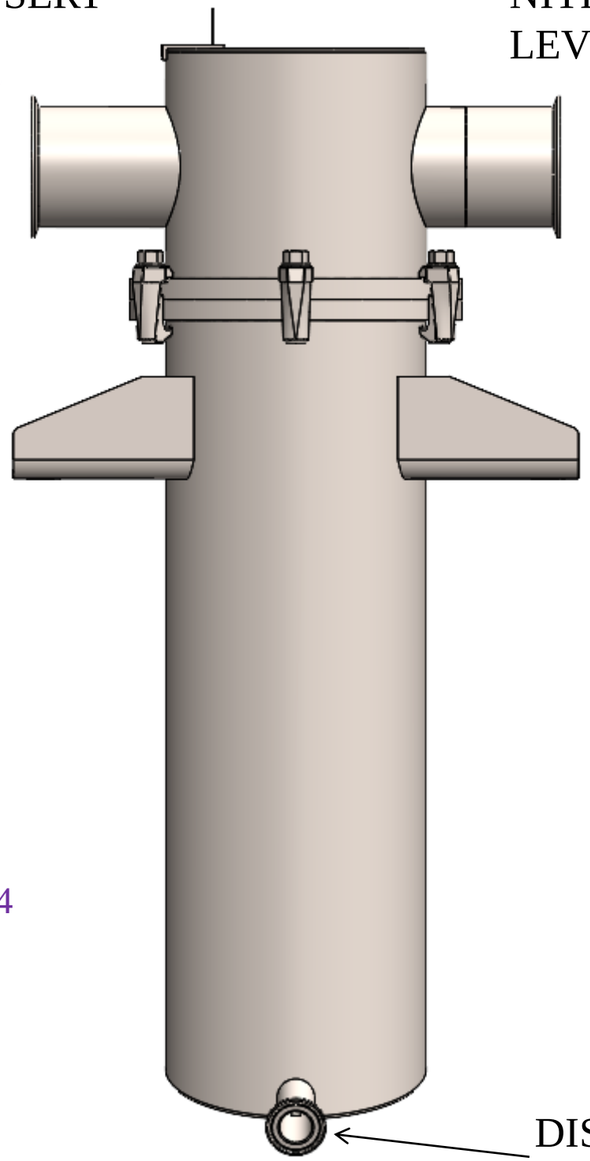
USED IN RF, SP1, SP2 ASSEMBLIES.



COLD TRAP INSERT ASSEMBLY
Details on page 17

BOTTOM ASSEMBLY
Details on page 14

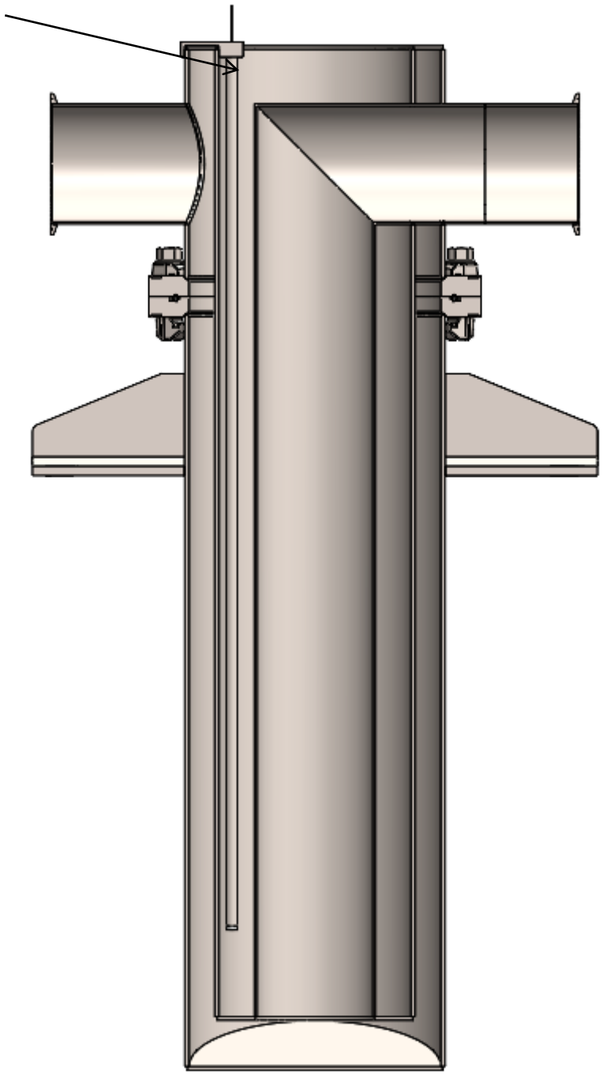
BACK VIEW



NITROGEN LEVEL SENSOR

DISTILLATE OUTLET
(Terpenes)

FRONT VIEW

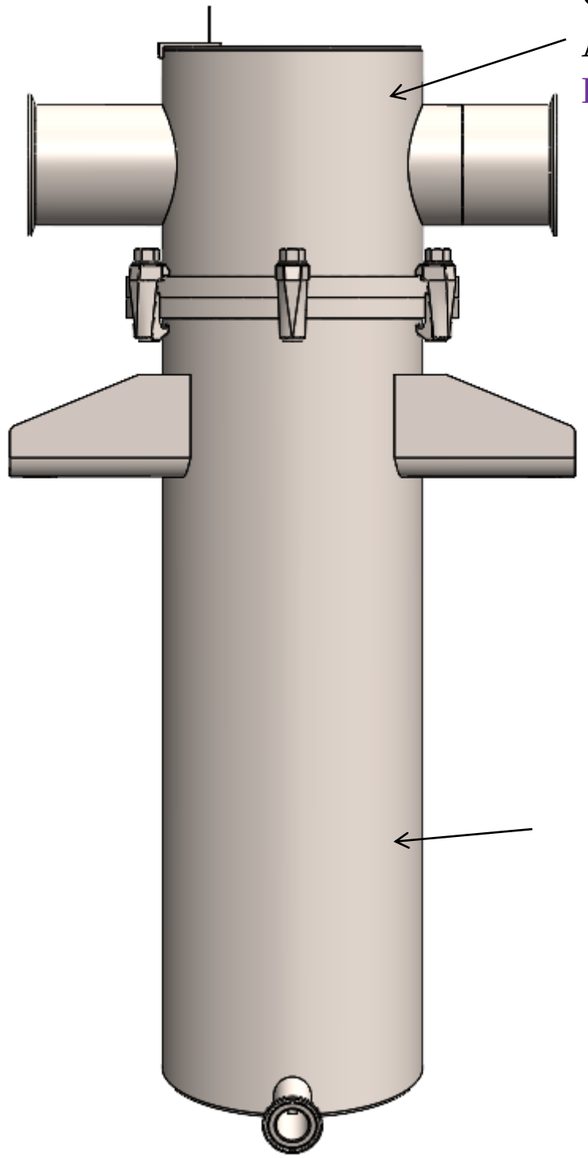


SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / COLD TRAP

USED IN RF, SP1, SP2 ASSEMBLIES.



COLD TRAP INSERT ASSEMBLY
Details on page 17

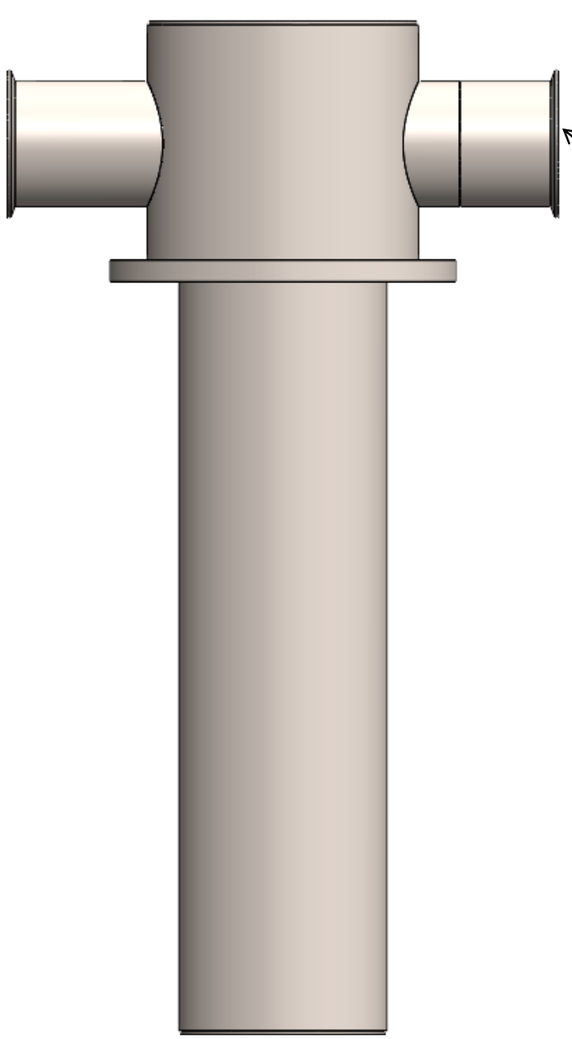
BOTTOM ASSEMBLY
Details on page 14

COLD TRAP:

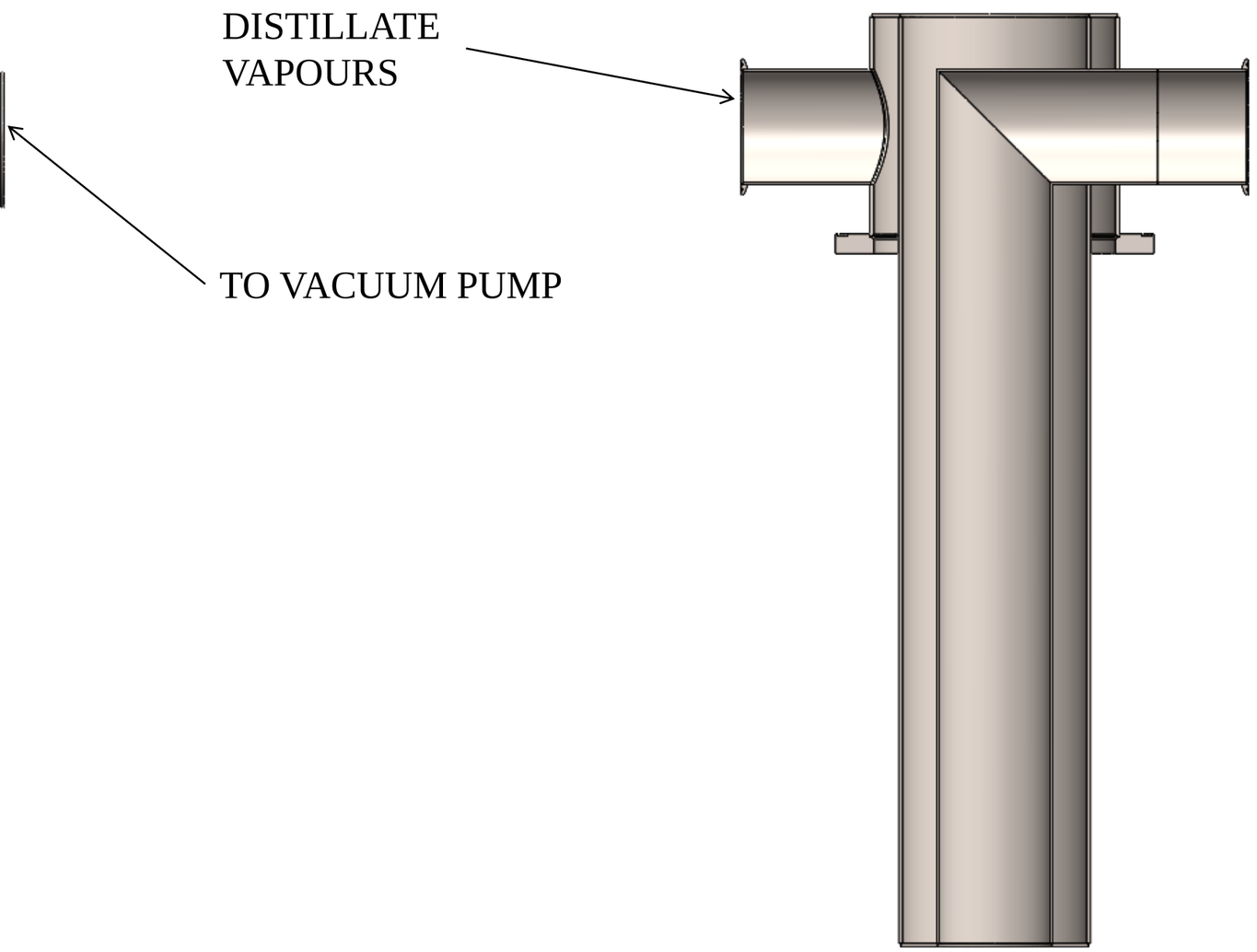
Cold Trap is responsible for trapping any non-condensed vapors and prevent it from entering the vacuum pump. It is also provided with liquid nitrogen to maximize the trapping efficiency. It is fitted with a liquid nitrogen inlet and a level sensor to control the level of nitrogen in it. The output of this is generally Terpenes.

SP25.0 / FRAME / COLD TRAP/ INSERT ASSEMBLY

USED IN COLD TRAP ASSEMBLIES OF RF, SP1, SP2.



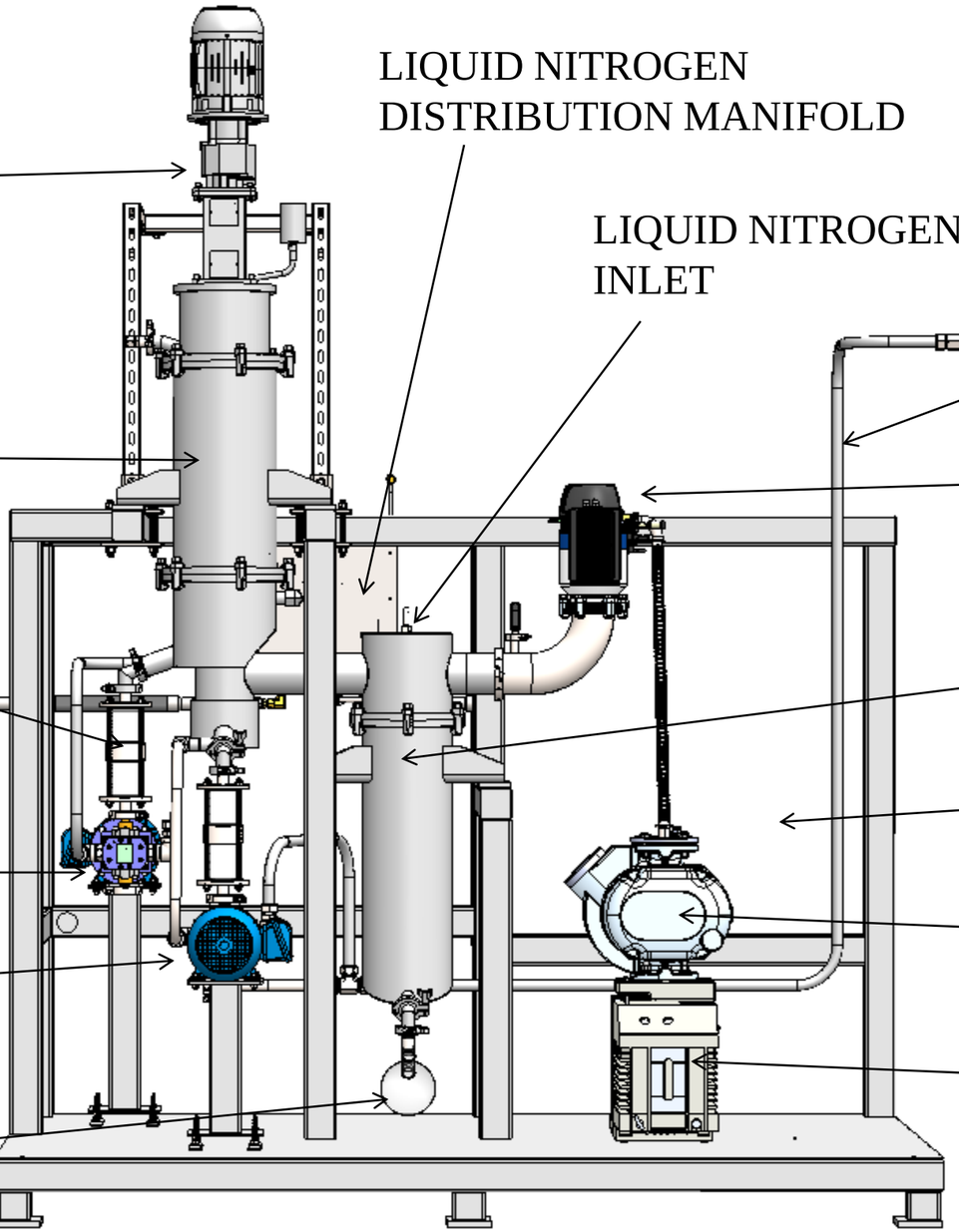
FRONT VIEW



SECTION VIEW

SP25.0 / FRAME / SP1

SP1 is the second stage of distillation. It does not contain a condenser. The extra vacuum pump in this stage helps to create more vacuum and maintain it. This vacuum helps the evaporation process at lower temperatures.



MOTOR GEARBOX ASSEMBLY
Details on page 25

LIQUID NITROGEN DISTRIBUTION MANIFOLD

LIQUID NITROGEN INLET

JACKATED FEED LINE
From: SP1 Residue
To: SP2 Evaporator

SP1 EVAPORATOR
Details on page19

TURBO VACUUM PUMP

SIGHT GLASS ASSEMBLY

COLD TRAP
Details on page 15

SP1 FRAMECABINET

RESIDUE PUMP
(Crude Oil)

ROOTS BLOWER PUMP

DISTILLATE PUMP
(Ethanol)

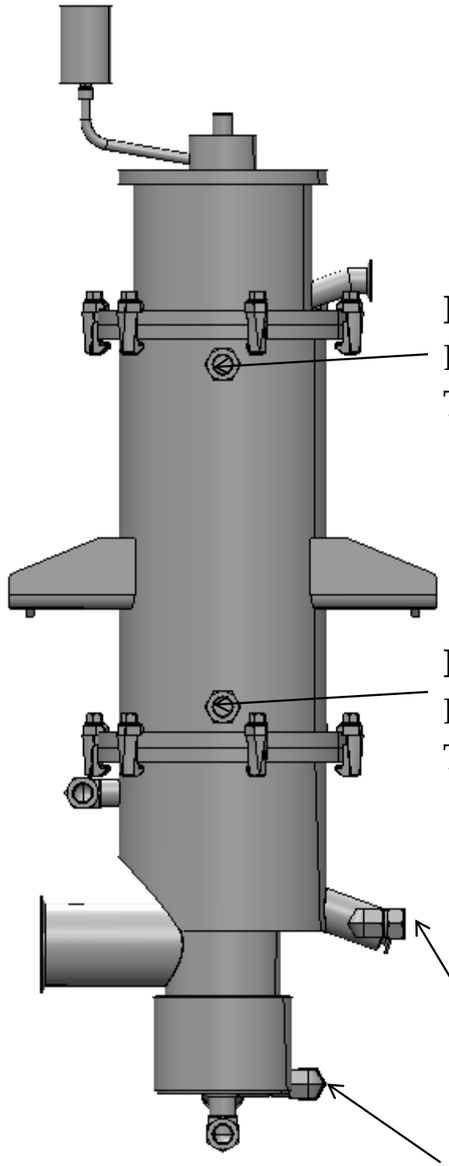
ROTARY VANE PUMP

COLLECTION FLASK
(Terpenes)

SP1 FRONT VIEW

SP25.0 / FRAME / SP EVAPORATOR

USED IN SP1, SP2.



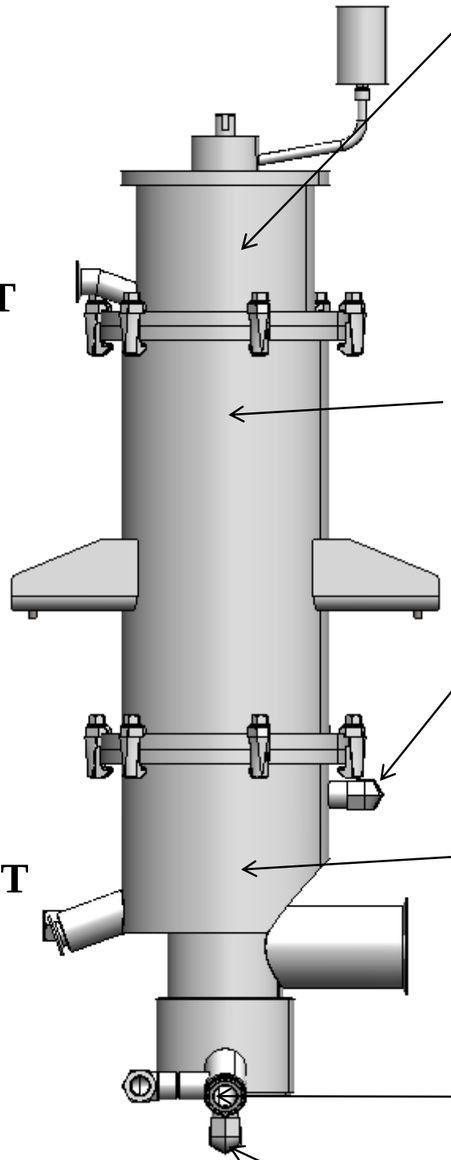
HEATING OIL OUTLET
From: SP1 Evap.
To: SP1 Evap. Circ.

HEATING OIL INLET
From: SP1 Evap. Circ.
To: SP1 Evap.

HEATING OIL OUTLET
From: SP1 Residue
To: Residue Pump

COOLANT OUTLET
From: SP1 Distillate
To: Distillate Pump

BACK VIEW



FEED SECTION ASSEMBLY
Details on page 21

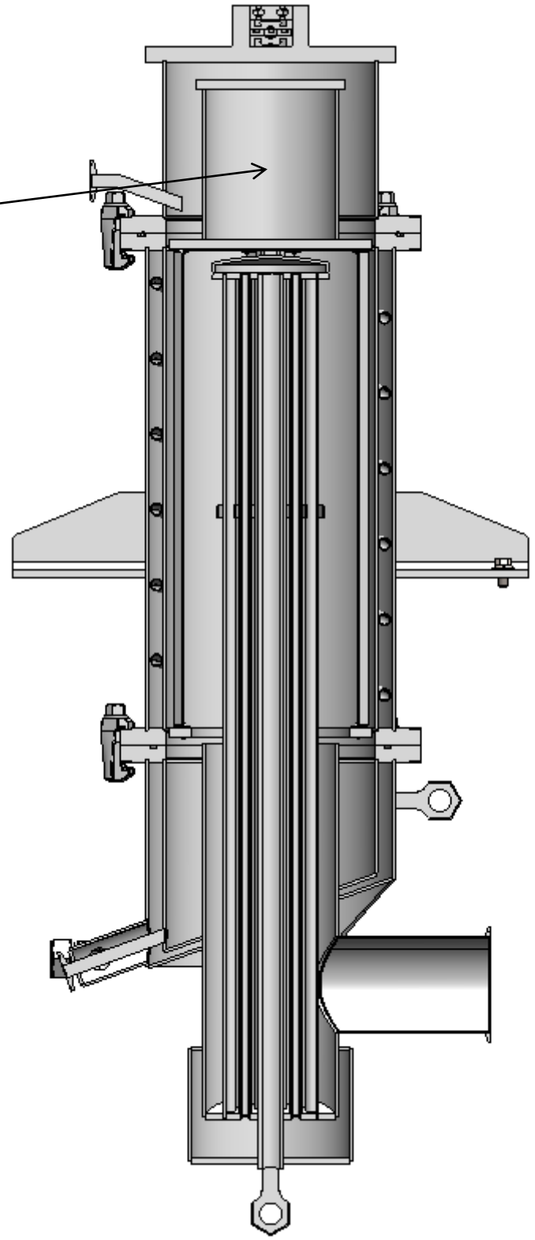
UPPER EVAP. ASSEMBLY
Details on page 22

LOWER EVAP. ASSEMBLY
Details on page 23

DISTILLATE OUTLET (Ethanol)

COOLANT INLET
From: SP1 Chiller
To: SP1 Lower Evap.

FRONT VIEW



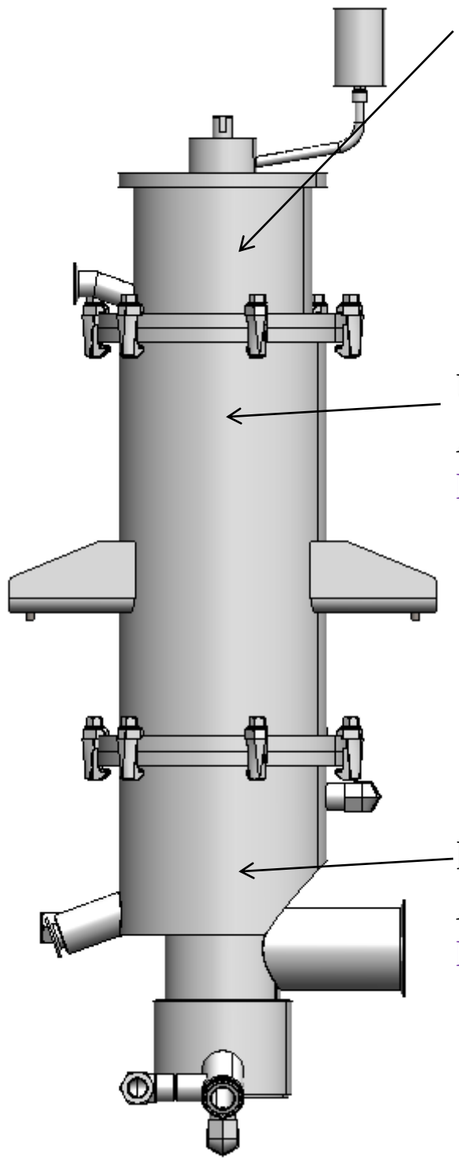
WIPER BASKET ASSEMBLY
Details on page 25

SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / SP EVAPORATOR

USED IN SP1, SP2.

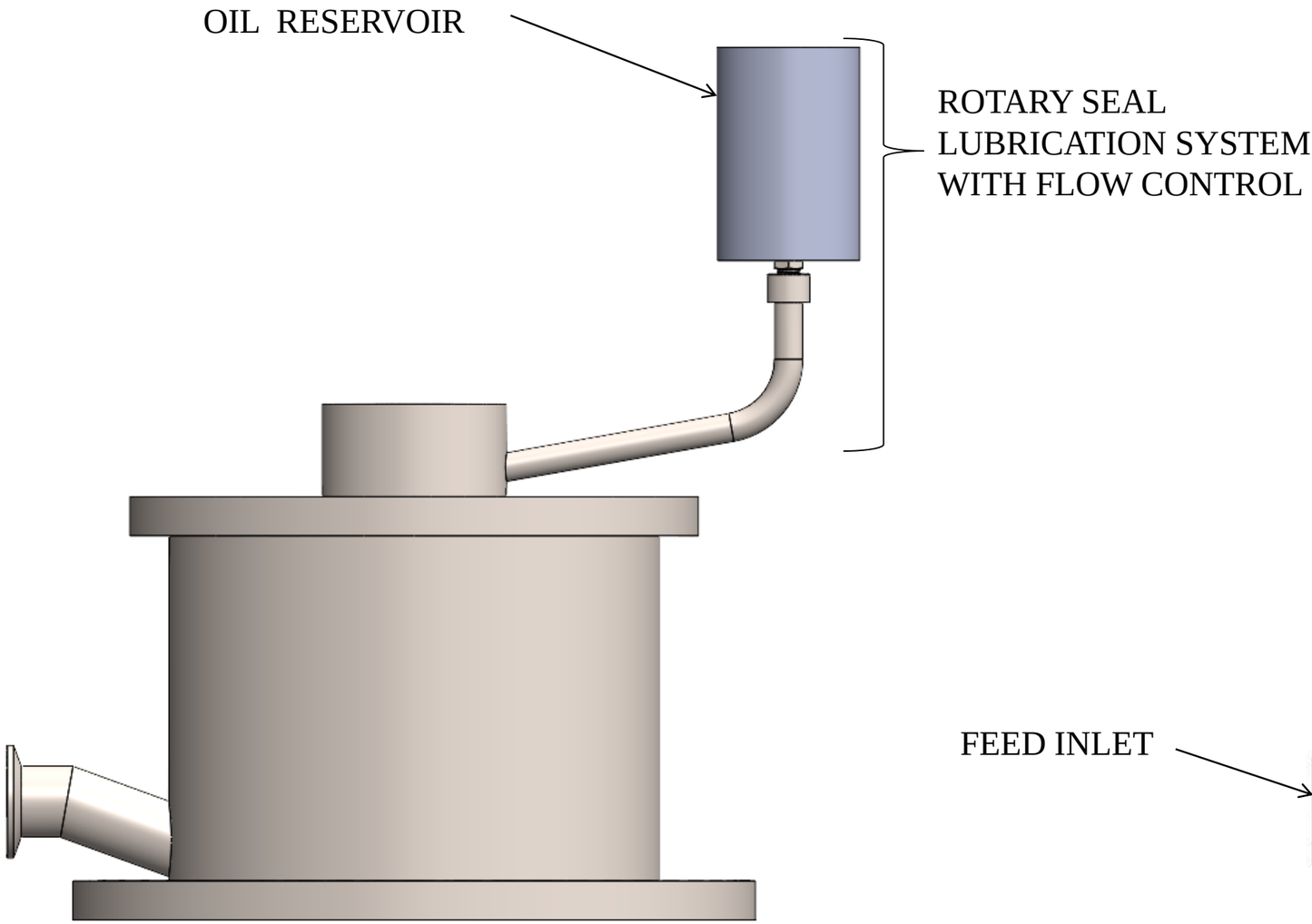


SP EVAPORATOR:

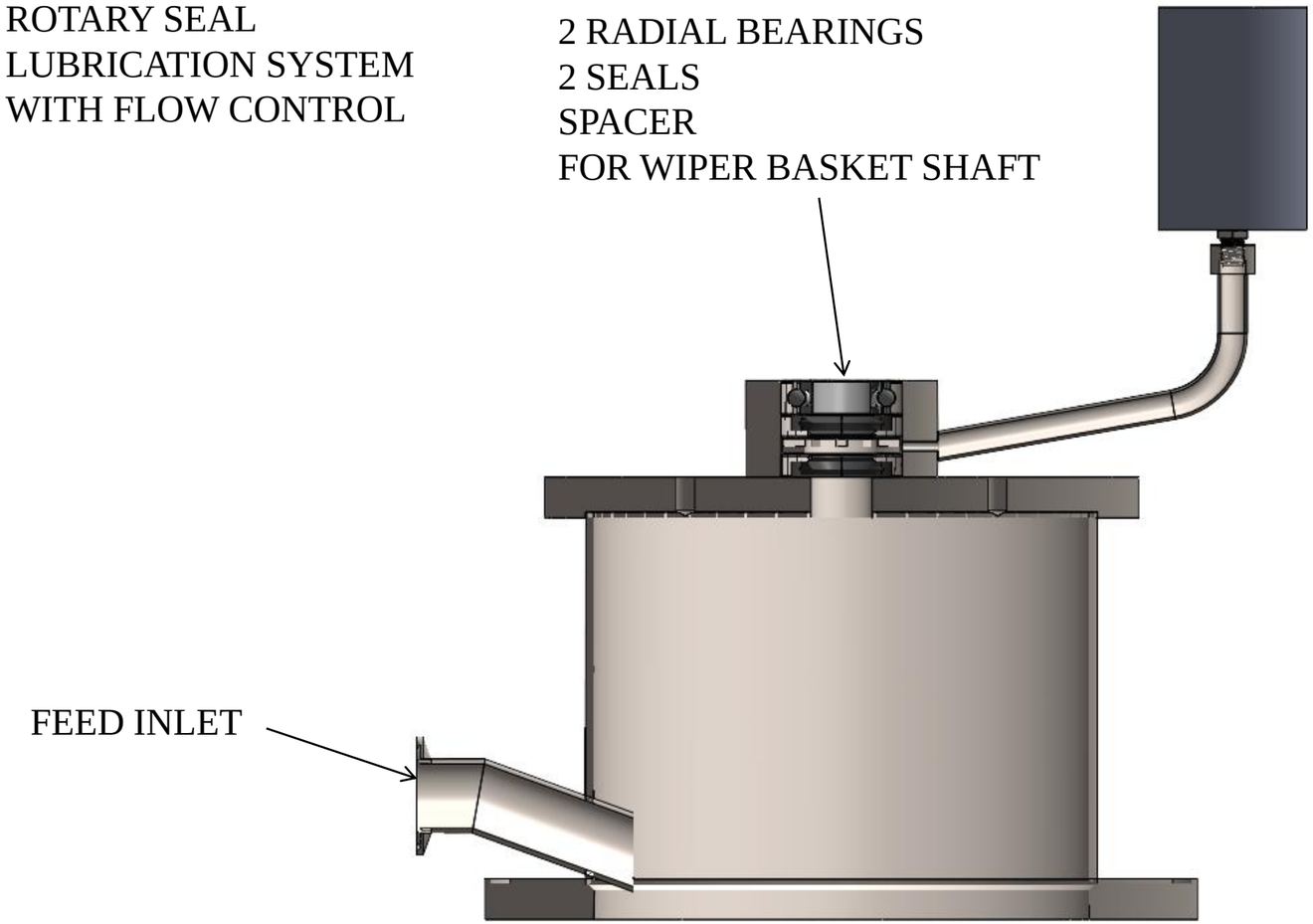
The evaporator for SP is specially designed to perform both, heating and condensing function at same time. It is a assembly of Feed Section, Upper Evaporator and a Lower Evaporator assemblies. Feed Section assembly houses the wiper basket assembly and acts as inlet for the residue from previous stage. Upper evaporator is a jacketed 316 SS tube with heating oil surrounding it. Coil around the tube serves better towards efficient heating Lower evaporator assembly is responsible for condensing the evaporated oil. It has separate sections for distillate and residue.

SP25.0 / FRAME / SP EVAPORATOR / FEED SECTION ASSEMBLY

USED IN SP EVAPORATOR IN SP1, SP2 ASSEMBLIES.



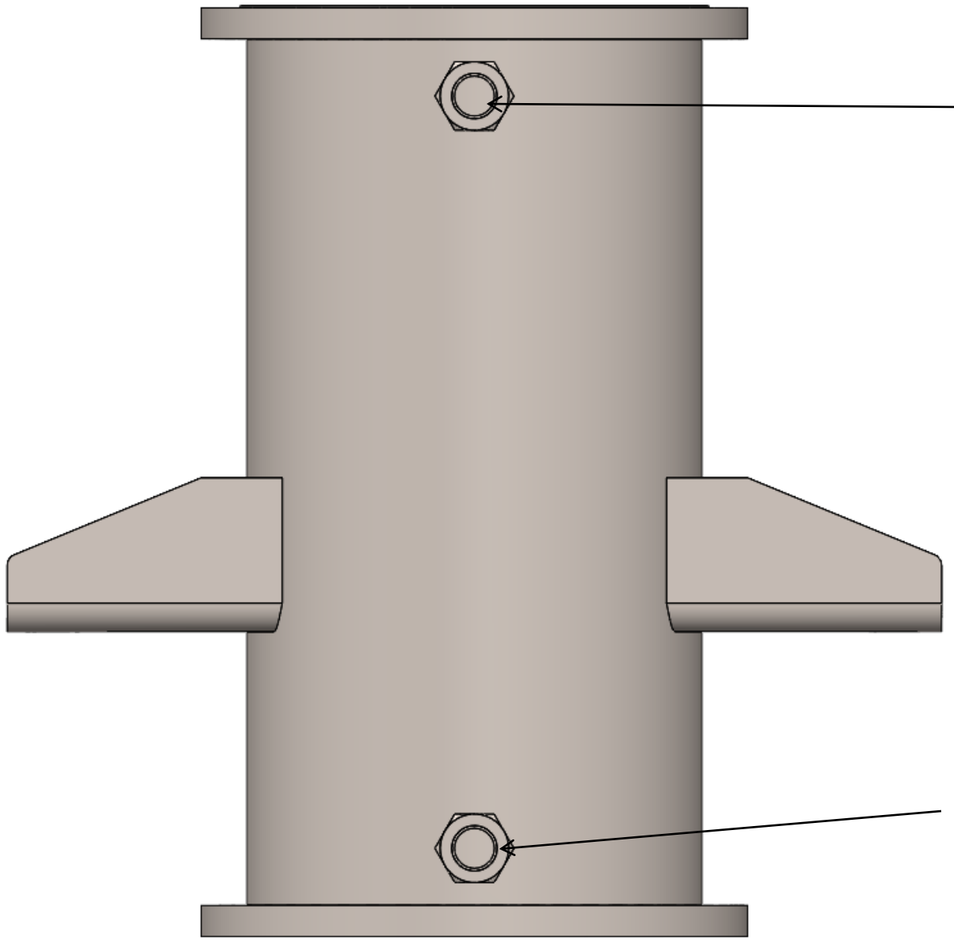
FRONT VIEW



SECTION VIEW

SP25.0 / FRAME / SP EVAPORATOR / UPPER EVAPORATOR

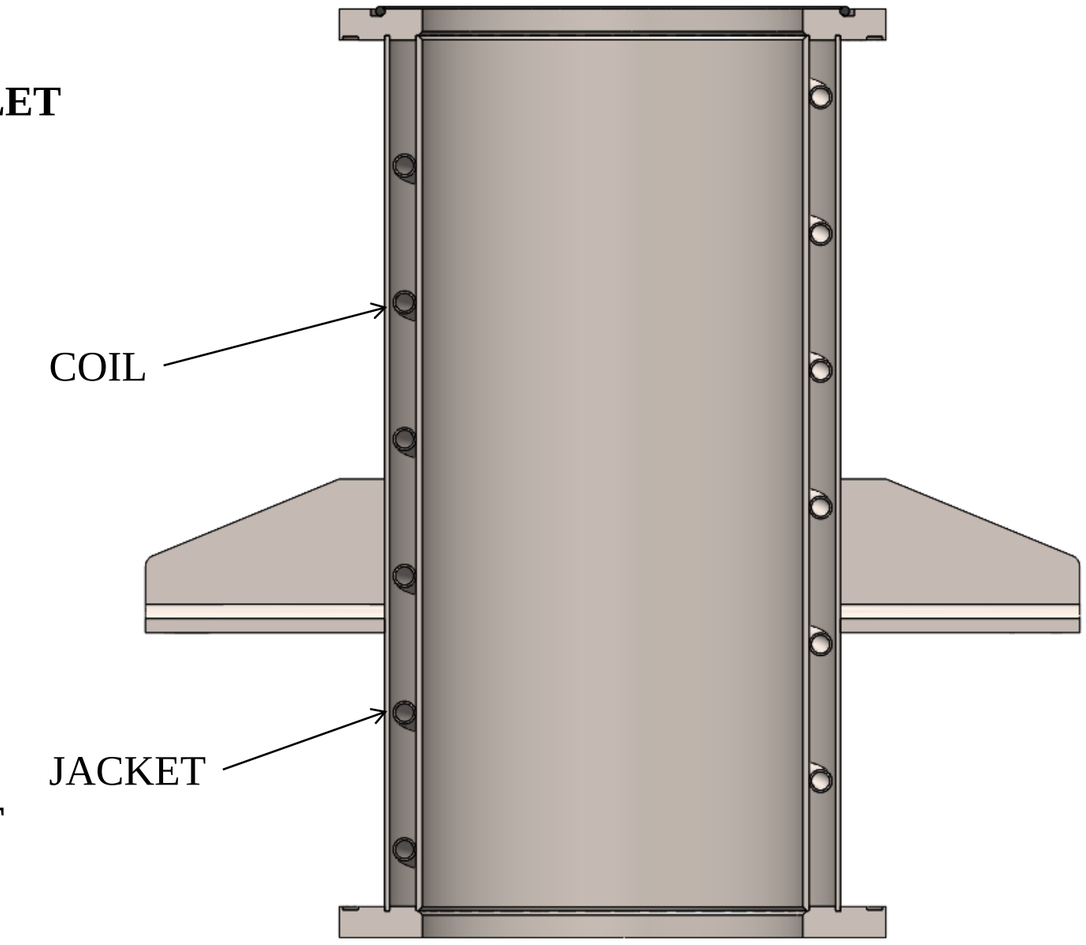
USED IN SP EVAPORATOR IN SP1, SP2 ASSEMBLIES.



HEATING OIL OUTLET
From: SP1 Evap.
To: SP1 Evap. Circ.

HEATING OIL INLET
From: SP1 Evap. Circ.
To: SP1 Evap.

BACK VIEW

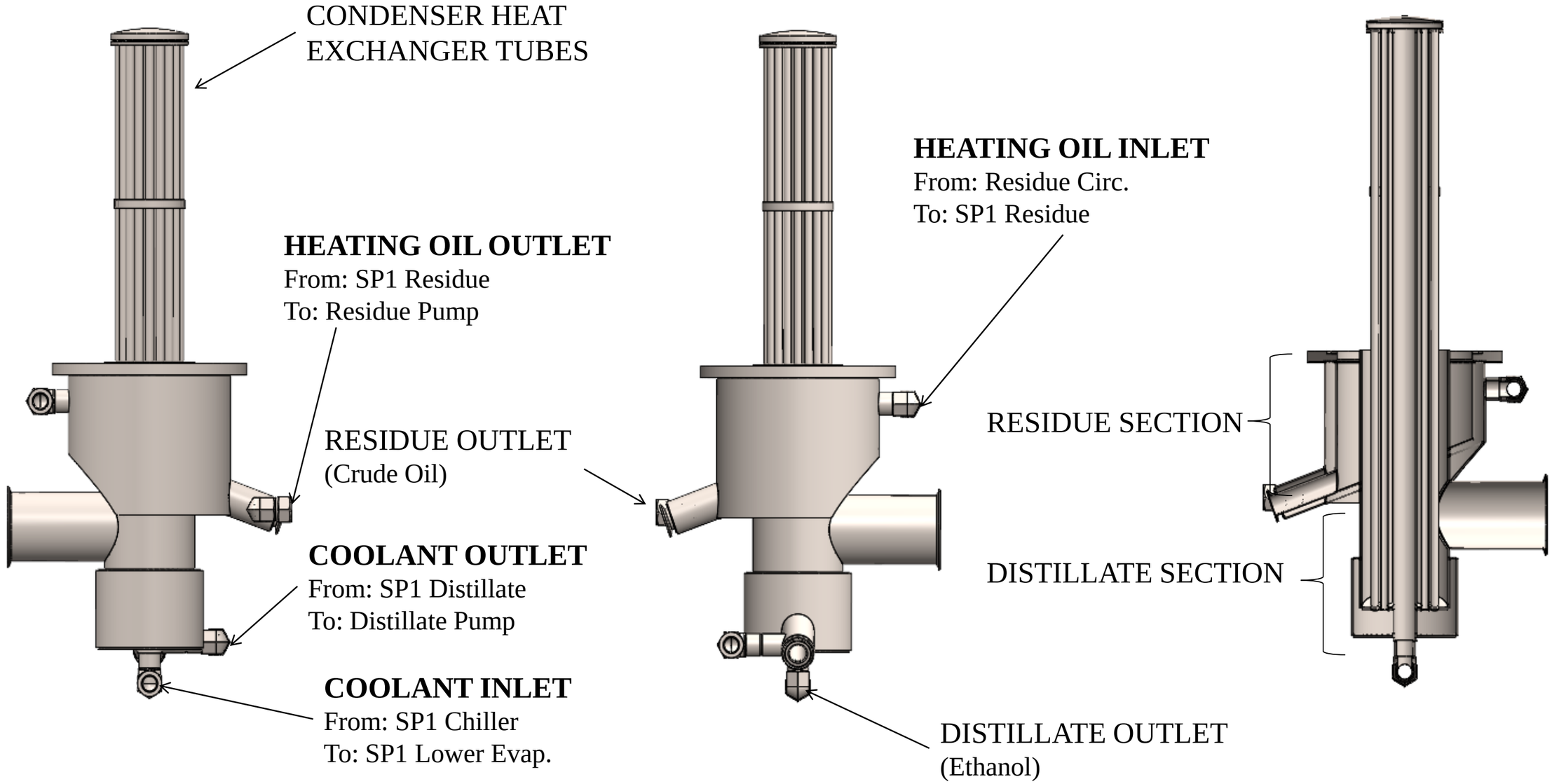


SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / SP EVAPORATOR / UPPER EVAPORATOR

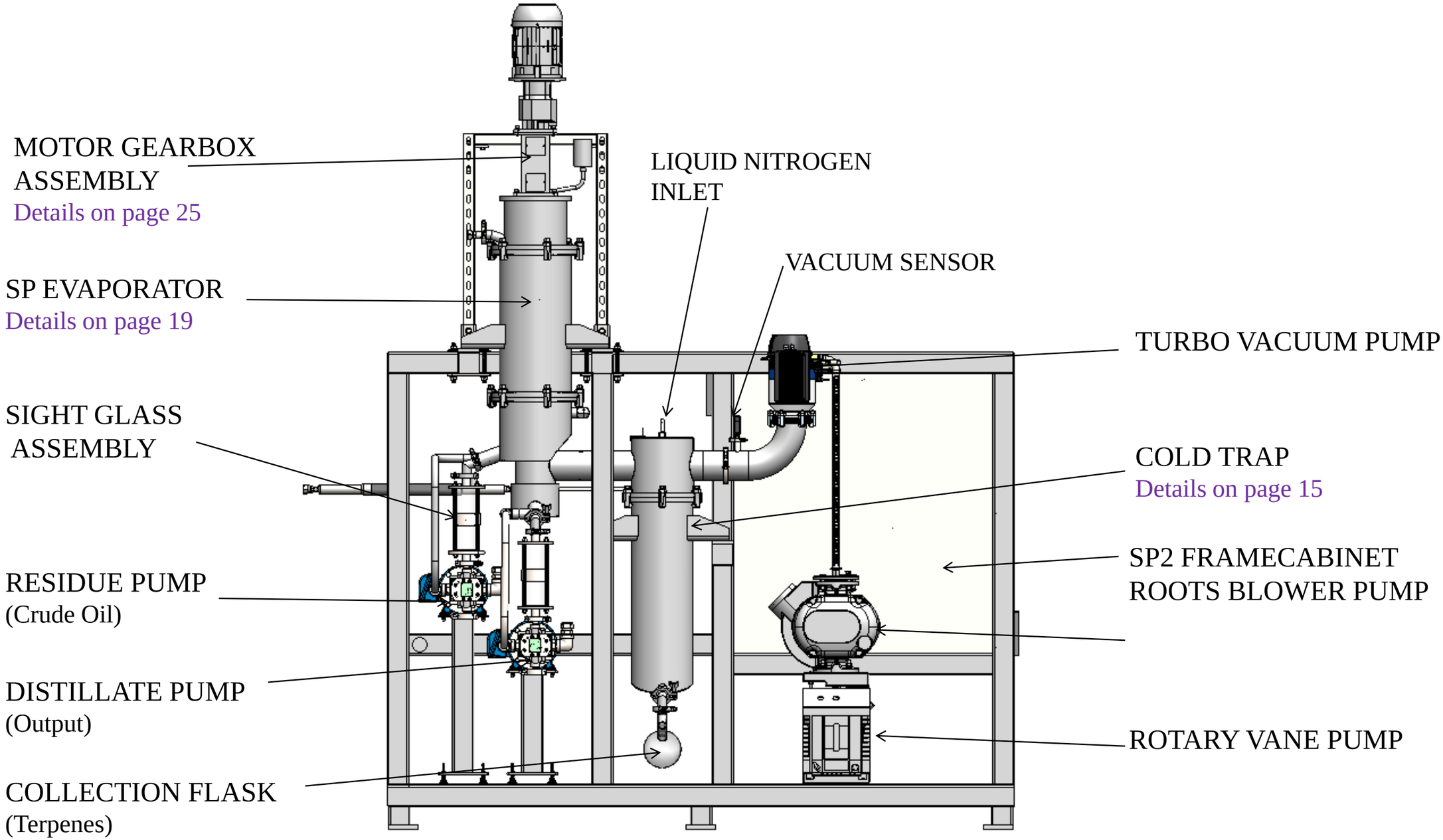
USED IN SP EVAPORATOR IN SP1, SP2 ASSEMBLIES.



RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR

SP25.0 / FRAME / SP2

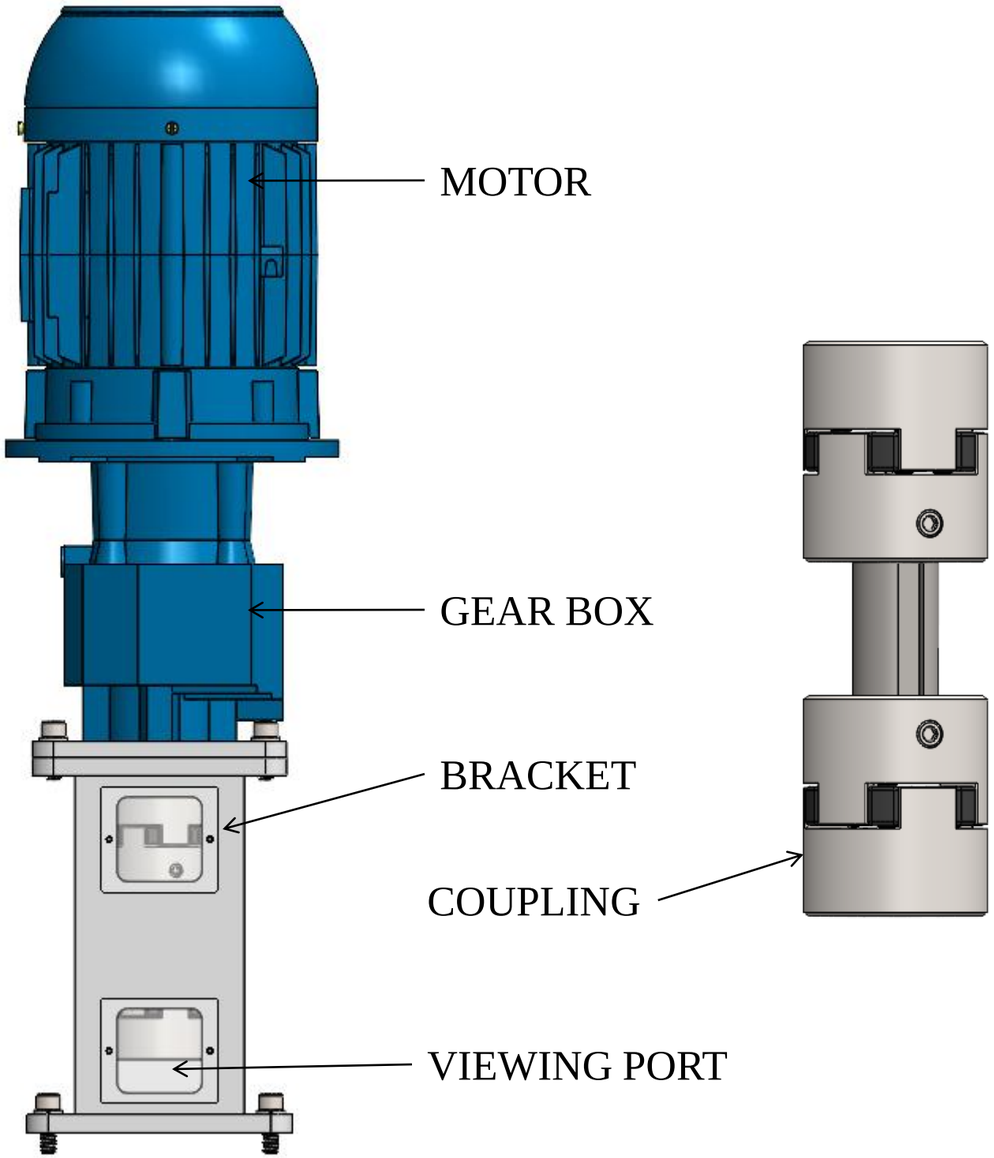
SP2 is the last stage of distillation. It does not contain a condenser. The extra vacuum pump in this stage helps to create more vacuum and maintain it. This vacuum helps the evaporation process at lower temperatures. It gives the final desired product.



SP2 FRONT VIEW

SP25.0 / FRAME / MOTOR GEAR BOX

USED IN WIPER BASKET ASSEMBLY IN RF, SP1, SP2.

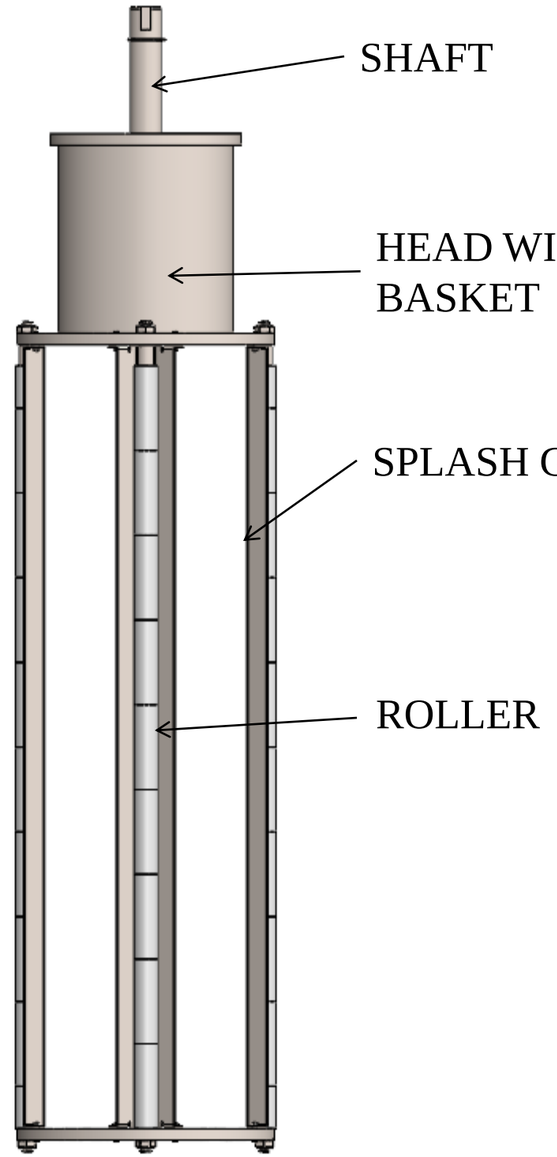


FRONT VIEW

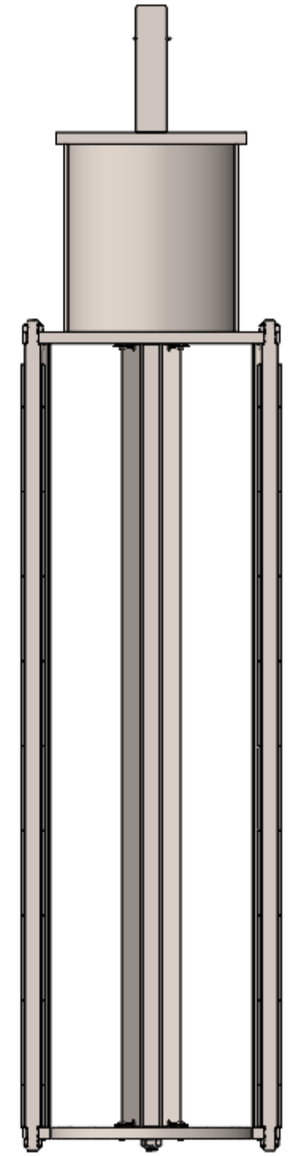
DETAIL VIEW

SP25.0 / FRAME / WIPER BASKET

USED IN WIPER BASKET ASSEMBLY IN RF, SP1, SP2.



FRONT VIEW



SECTION VIEW

RF- ROLLED FILM SP1- SHORT PATH 1 SP2- SHORT PATH 2 EVAP- EVAPORATOR CIRC- CIRCULATOR